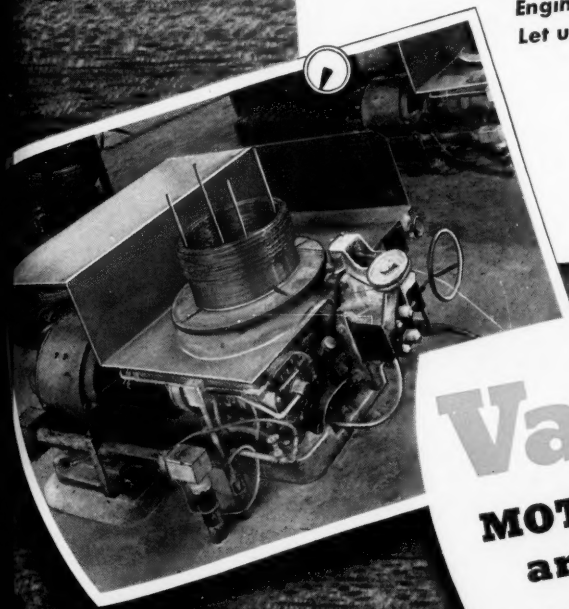
MAY, 1948

WIRE AND WIRE PRODUCTS

ENGINEERING DOES IT!

Beyond the factors of precision manufacture and fine materials in Vaughn Machinery performance is the ultimate quality of Vaughn Engineering . . . a continuous, intensive and creative process that is based upon our many years of complete familiarity with the needs of wire producers. Vaughn Engineering solves wire drawing problems! Let us cooperate with you!



Vaughn

MOTOBLOC and MOTOBLOX

"Quick on the Draw!"

THE VAUGHN MACHINERY COMPANY

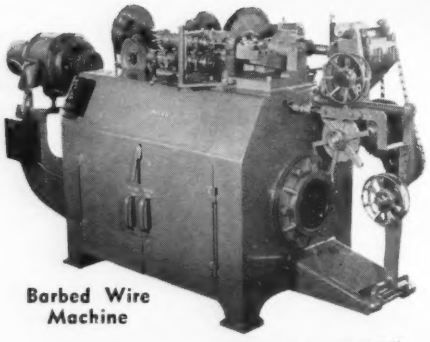
CUYAHOGA FALLS, OHIO, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT . . . Continuous or Single Hole . . . for the Largest Bars and Tubes . . . for the Smallest Wire . . . Ferrous, Non-Ferrous Materials or their Alloys

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Wean EQUIPMENT Corporation

8-inch Single Strand
Wire Flattening Mill
With Wire Straighteners



Barbed Wire
Machine

The WEAN EQUIPMENT CORPORATION is recognized as a specialist in high-efficiency strip and wire mill equipment.

COLD ROLLING MACHINERY

For 36" Wide Material and Narrower

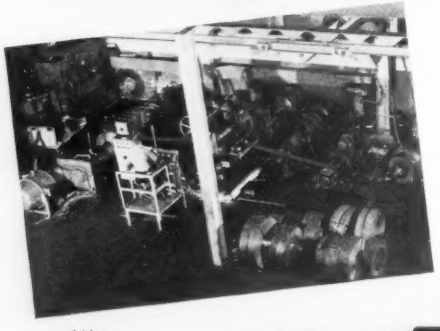
MILLS — REELS — SLITTERS — LEVELERS
COILERS — EDGERS — SCALE BREAKERS — SHEARS
SCRAP BALLERS — CONTINUOUS PICKLING

WIRE MILL EQUIPMENT

PATENTING, GALVANIZING AND TINNING TAKE-UP FRAMES
WIRE FLATTENING MILLS — SPOOLERS
NAIL GALVANIZING AND BLUEING MACHINES
BARBED WIRE AND FIELD FENCE MACHINES

WEAN EQUIPMENT CORPORATION

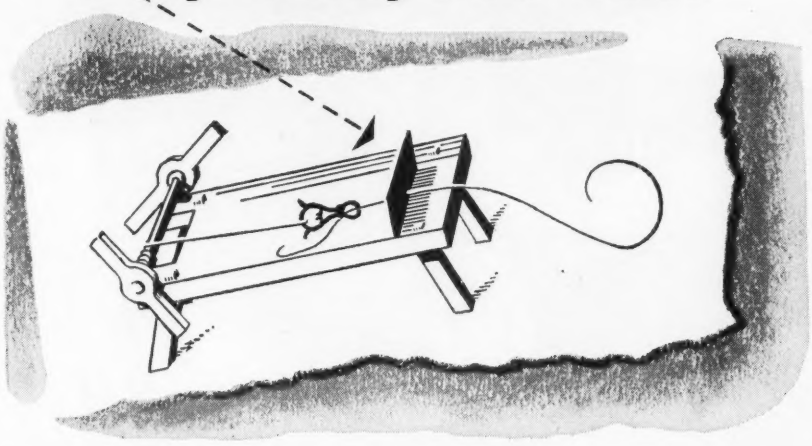
CLEVELAND • OHIO



Wean
Slitting Line

No. 1155
Field Fence
Machine

This gadget *WASN'T* backed by twenty-nine tests!



THE DIE PLATE on this sixteenth-century wire-drawing contrivance *wasn't* backed by twenty-nine tests—"quality-insurance"—

But your Carboloy dies of today are!

Every year Carboloy spends thousands of dollars on testing and improving the quality of the dies you use. You should see the battery of tests for purity and performance your Carboloy Cemented Carbide dies have to pass!

Tested at every step

Carboloy dies start as pure powders. Here's why we're so sure they're pure:

Before acceptance for production, exhaustive tests, particle counts and chemical analysis check them for purity. After the powders have been milled, a pressed control-piece is put through a furnace, tested for hardness and density, given transverse-rupture and photomicrographic tests.

That's *before* any powder is accepted for production.

The powder and the dies during and after manufacture are given tests including six chemical, twenty physical and a metallographic test—tests for X-ray diffraction pattern, and spectrographic tests for the effects of traces of other materials on performance and quality.

Your Carboloy dies, in this way, are insured of high quality and purity. They're as nearly perfect as humanly possible before they're passed—

And passed along to you.

Wide variety and special services, too

In addition to this assurance of quality, Carboloy offers you the advantages of a varied line of wire-, bar- and tube-drawing products, including a wide range of standards.

And a *Complete Package* Die Service gives you four special benefits, at no extra cost:

1—Service centers and field engineers to help you

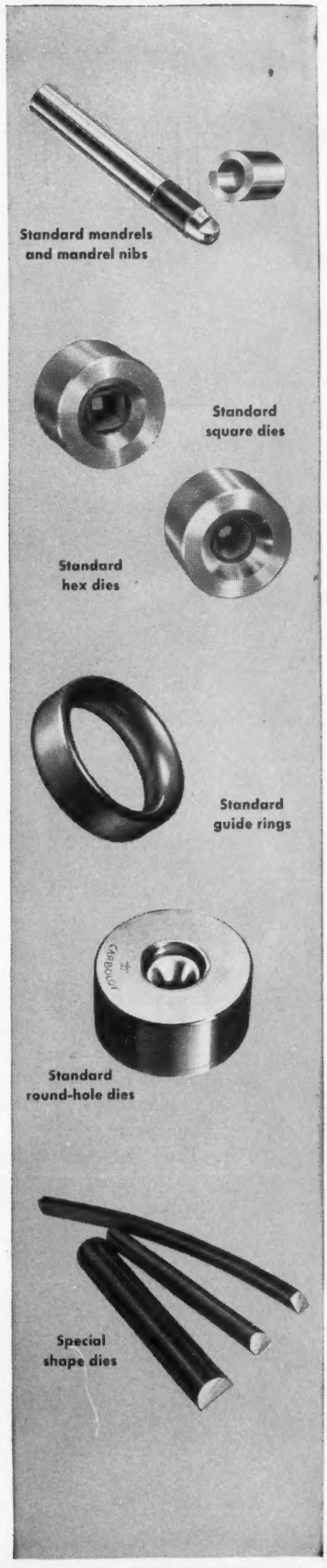
2—Free training for your die-room personnel

3—Recommendations for efficient die-room equipment and operation

4—Local stocks to supply you quickly

Ask for more information

Let us tell you more about Carboloy dies and Carboloy's extra benefits and assurances of quality. And ask for the 64-page DIE SERVICE MANUAL, D-119, the best of its kind. *Carboloy Company, Inc., 11171 E. 8 Mile Blvd., Detroit 32, Michigan.*



CARBOLOY®

CEMENTED CARBIDE

For lasting comfort . . .

choose quality wire

A well-made spring unit is not the result of guesswork. It's planned that way. Lasting comfort and sound construction are achieved by correct design, good workmanship, and the use of the highest-quality spring wire.

Many top-flight manufacturers have long been consistent users of Silver Star Spring Wire. They keep on using it because they know that good spring construction must start with quality spring wire—wire that is uniform in temper, gauge, and physical properties.

Silver Star Spring Wire is a one-purpose wire—engineered solely for use in bedding and upholstery springs. Because of its special analysis and careful processing, it is adaptable to virtually all spring designs and is readily coiled, knotted, and crimped. Scientifically produced in Bethlehem's modern wire mills, it must pass rigid specifications before shipment.

Here's the quality wire you need to improve the performance of your spring units. Order a trial lot and give it a thorough test in your own plant. It's available in a wide range of grades and sizes to meet your needs. The nearest Bethlehem district office will gladly assist you—or write us direct.

BETHLEHEM STEEL

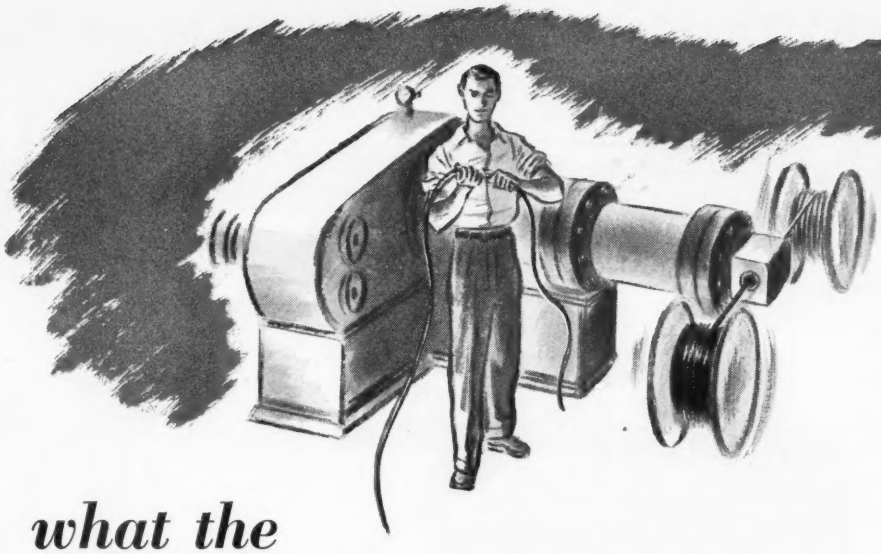
Silver Star SPRING WIRE BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem Products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

WIRE & WIRE PRODUCTS, Vol. 23, No. 5, May, 1948. Publication Office, at 61 Cliff Street, New York 7, N. Y. Executive Office, 300 Main Street, Stamford, Conn. Published monthly by the Quinn-Brown Corp., Richard E. Brown, President; R. S. Spengel, Secy. and Treas. Subscription price: U. S., $5.00; Canada, $5.00 per year; 50 cents per copy; Foreign, $7.50 per year. Entered as second class matter, June 14, 1946, at the Post Office, New York, N. Y., under Act of March 3, 1879.



what the WELL-DRESSED WIRE *will wear!*

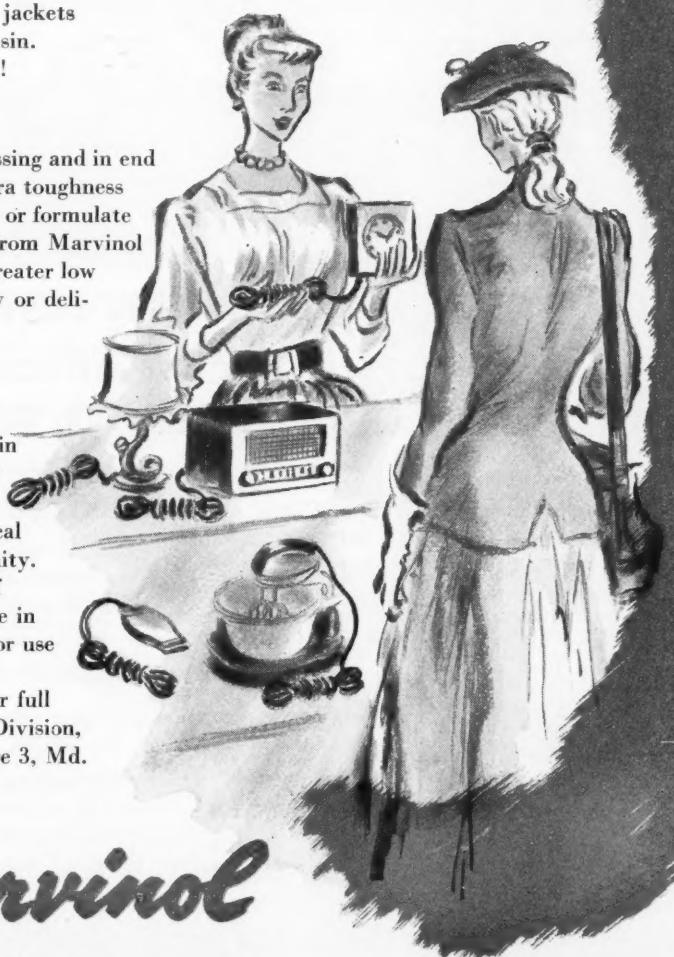
THERE'S a new look for wiring, too . . . jackets made from Marvinol,® the better vinyl resin. Look at these advantages Marvinol offers!

MORE STABILITY!

Marvinol offers superior stability in processing and in end products. High molecular weight gives extra toughness . . . yet it is easy to extrude, injection mold or formulate by other processes. Wire covering made from Marvinol has greater resistance to heat and light, greater low temperature flexibility, may be brilliantly or delicately colored.

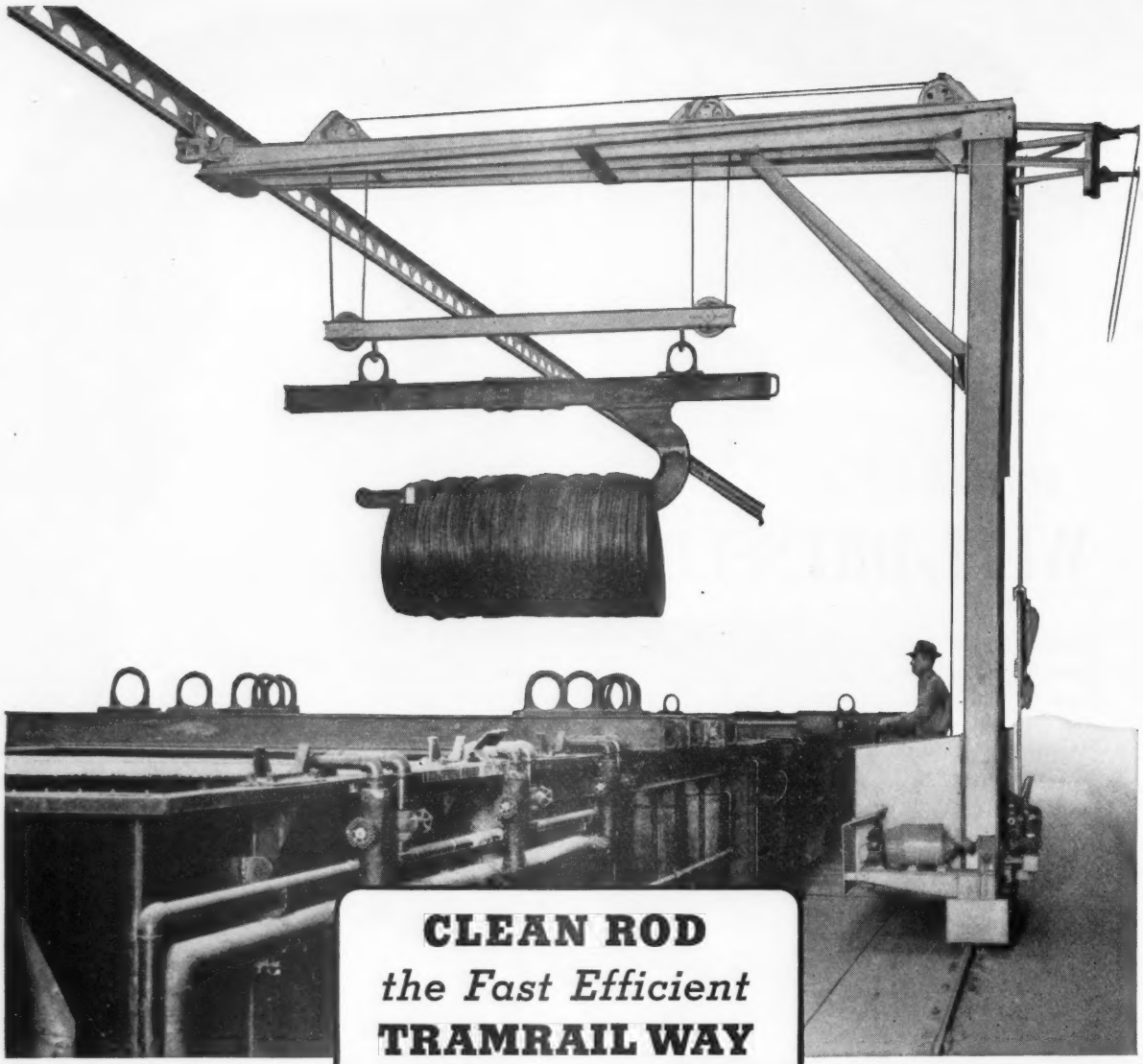
MORE UNIFORMITY!

Now available in production quantities, Marvinol resins are a development of Martin research and Martin's quarter-century of plastics experience. They're being produced in the world's most modern chemical plant to assure you of unexcelled uniformity. The Glenn L. Martin Company, maker of Marvinol, does not compound or fabricate in the plastics field. If you make, coat, buy or use wire, our expert sales engineers and fully equipped customer service laboratory offer full technical cooperation. Write: Chemicals Division, The Glenn L. Martin Company, Baltimore 3, Md.



Martin ★ Marvinol

RESINS, PLASTICIZERS AND STABILIZERS, PRODUCED BY THE CHEMICALS DIVISION OF
THE GLENN L. MARTIN COMPANY • AN INTERNATIONAL INSTITUTION
"BETTER PRODUCTS, GREATER PROGRESS, ARE MADE BY MARTIN"



CLEAN ROD
the Fast Efficient
TRAMRAIL WAY

With a Cleveland Tramrail Cleaning House Gantry Crane a cleaning house can be organized to secure the advantages of straight line production efficiency. This cuts space required, enforces cleanliness and better working conditions. Of prime importance it speeds production and brings down costs tremendously.

All operations—acid bath, rinse, lime dip, bake—can be handled by one man, and of significance, far greater tonnage can be cleaned per day than by customary methods.

Let us give you the facts about many successful cleaning house installations.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

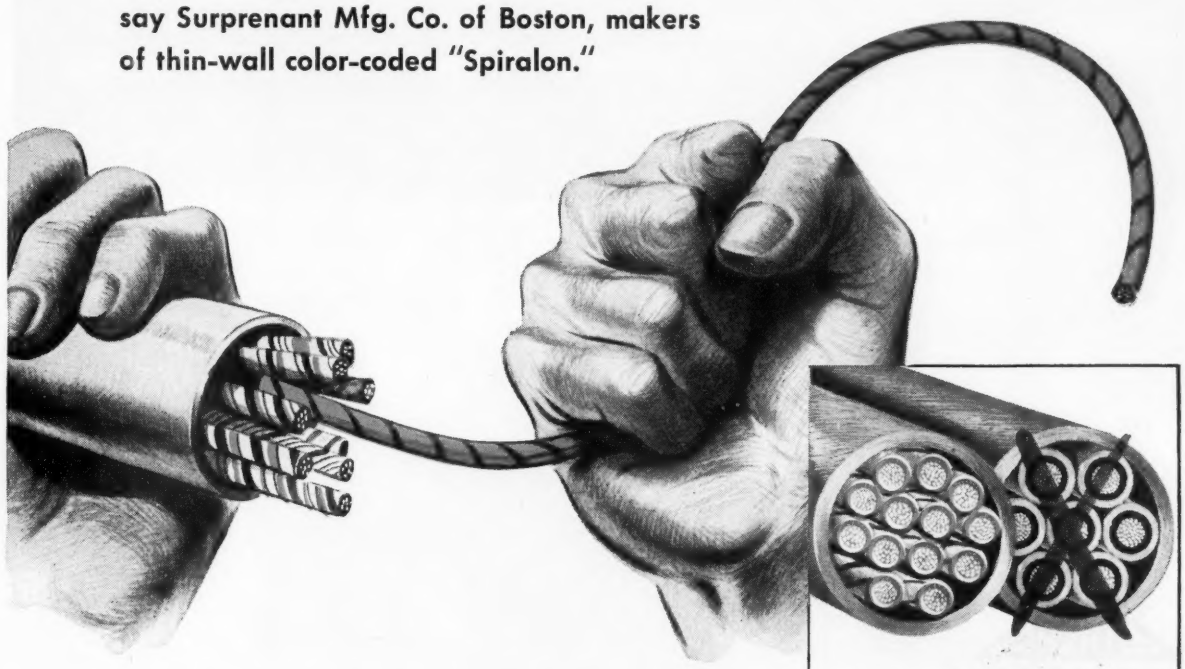
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
9208 EAST 288th STREET • WICKLIFFE, OHIO

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

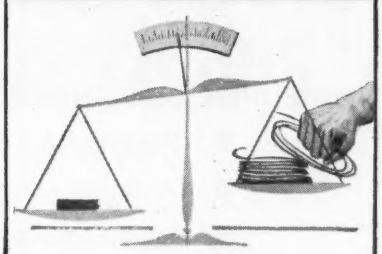
Why are big wire producers using Du Pont NYLON plastic?

"Unsurpassed as a protective jacket for wire,"

say Surprenant Mfg. Co. of Boston, makers of thin-wall color-coded "Spiralon."

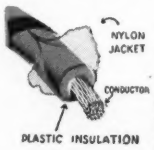


Wire has **SMALLER DIAMETER,** permits more wires in limited area.



Wire is **LIGHT IN WEIGHT,** and resists heat, oils, water, chemicals, abrasion and flexing.

"Jacketing of Du Pont NYLON helps us produce a color-coded wire with fungus- and abrasion-resistance, extra smoothness for easier pulling, and many other advantages."



"Our new 'Spiralon' wire is available in many thousands of distinct color combinations, making identification easy even in the most complex installations," report Surprenant Manufacturing Company. "It consists of a conductor, color-coded plastic insulation, and a transparent protective jacket of Du Pont nylon. The nylon cover can be applied easily and rapidly. It's *extra smooth.* It's tough and long lasting. It resists heat, oils, many chemicals, abrasion, and flexing. And nylon helps us produce a wire with *smaller diameter* and *lighter weight.* We feel it is unsurpassed as a thin-wall extruded covering."

Know these facts—for profits

Wire, cable and many other electrical products today are *better* products, because of Du Pont nylon.

This Du Pont plastic can be molded or extruded, and colored to fit specifications. For your own good—don't overlook its remarkable properties. Write for free booklet, "65 Success Stories of Product Improvement." Filled with helpful facts. Just address: E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 155, Arlington, N. J.

TUNE IN Du Pont's "Cavalcade of America"—Monday Evenings—NBC coast to coast.

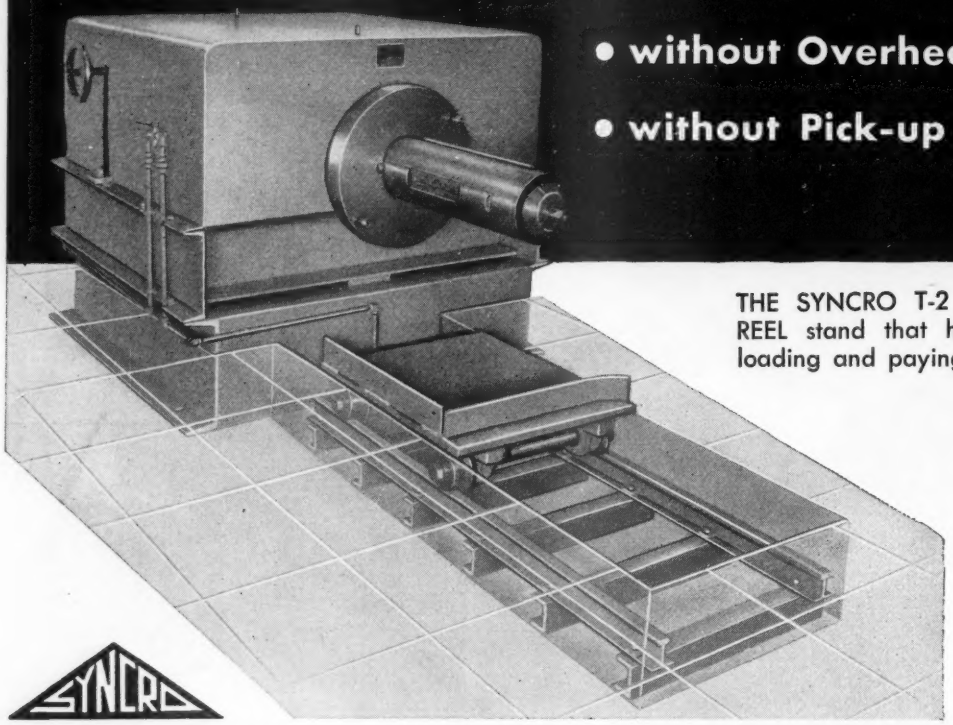
CHECK THESE 7 BASIC FEATURES OF NYLON FOR ELECTRICAL USES

1. Good flexibility
2. High tensile strength
3. Extreme toughness
4. Abrasion resistance
5. Resistance to permanent set
6. Chemical resistance
7. Ability to be molded or extruded . . . colored or in natural color.

DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

NOW–Heavy Reels for pay-off can be loaded

- without Overhead Cranes
- without Pick-up Grapples



THE SYNCRO T-2 4000# PAY-OFF REEL stand that has revolutionized loading and paying-off.

Loads faster and easier—No lifting—No positioning—Reels are rolled on floor level dolly on narrow gauge rails. Dolly is pneumatically controlled by air cock on the side of the unit.

NOTE THESE OUTSTANDING FEATURES

- Patented 8" expanding type arbor
- Accessible hand wheel control for hold back tension mechanism
- Electro-pneumatically controlled brakes to initiate a pay-off stop in syncronism with main machine

The SYNCRO T-2 4000# PAY-OFF REEL STAND was specially designed for use with heavy duty wire drawing or other wire processing equipment.

Your inquiries are invited

Machinery for the Wire Industry

1724

SYNCRO MACHINE COMPANY

611 Sayre Avenue **Perth Amboy, N. J.**

Affiliated Company

Winget-Syncro, Rochester, Kent, England

A Challenge to real Americans

WHY is it necessary to sell America to Americans? One of the reasons is, not until now did the people of this country have to be shown that they lived in the most favored and most favorable country on earth. Where are the salesmen to do this job? Every community has its leaders who have this responsibility, not only to themselves, but to their families, their community and their country

The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio

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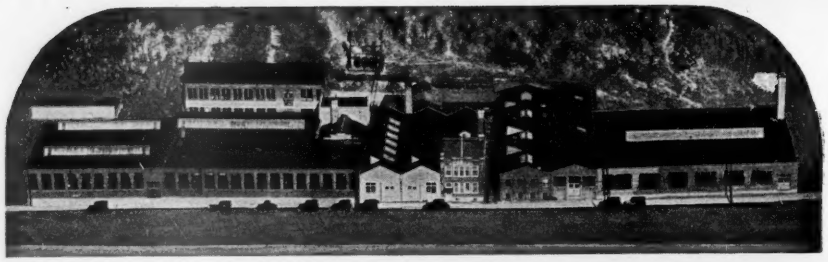
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - TIE PLATES AND SPIKES - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS.

HUDCO



HUDSON WIRE CO. PLANT AT OSSINING, N. Y.

This plant is one of the most up-to-date and completely equipped plants in the world for the production of "HUDCO" fine wires in all metals.

ESTABLISHED IN 1902

HUDCO

WIRES FOR METAL SPRAYING

Pure lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire. High Conductivity, Electric Wire. Cadmium, Nickel Silver, Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze, Brush Wires, Crimp and Straight, Brass, Steel, Nickel Silver, Copper and Phosphor Bronze.

HUDCO

FINE BARE WIRES

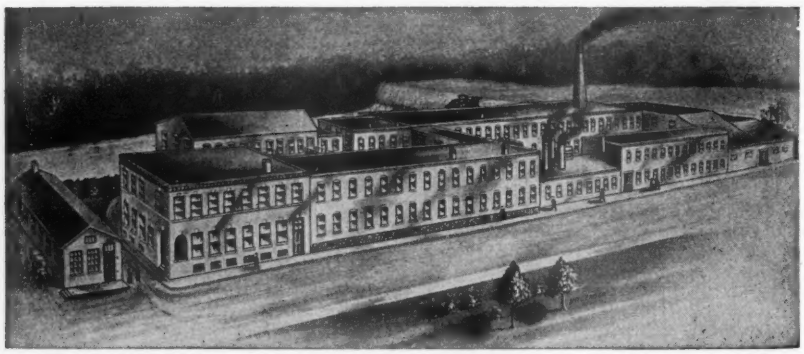
High Brass, Low Brass, Zinz 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver-Plated Copper, False Gold and Copper. Cadmium, Nickel Silver, Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing.

BETTER WIRE AT LOWER COST

Send Us Your Specifications and Let Us Quote Prices

HUDSON WIRE COMPANY • OSSINING, N. Y.



Winsted Division of HUDSON WIRE CO. at Winsted, Conn., modern and completely equiped enamelled wire plant for LEAKPROOF ENAMELLED WIRE and all standard and special coverings.

WINCO

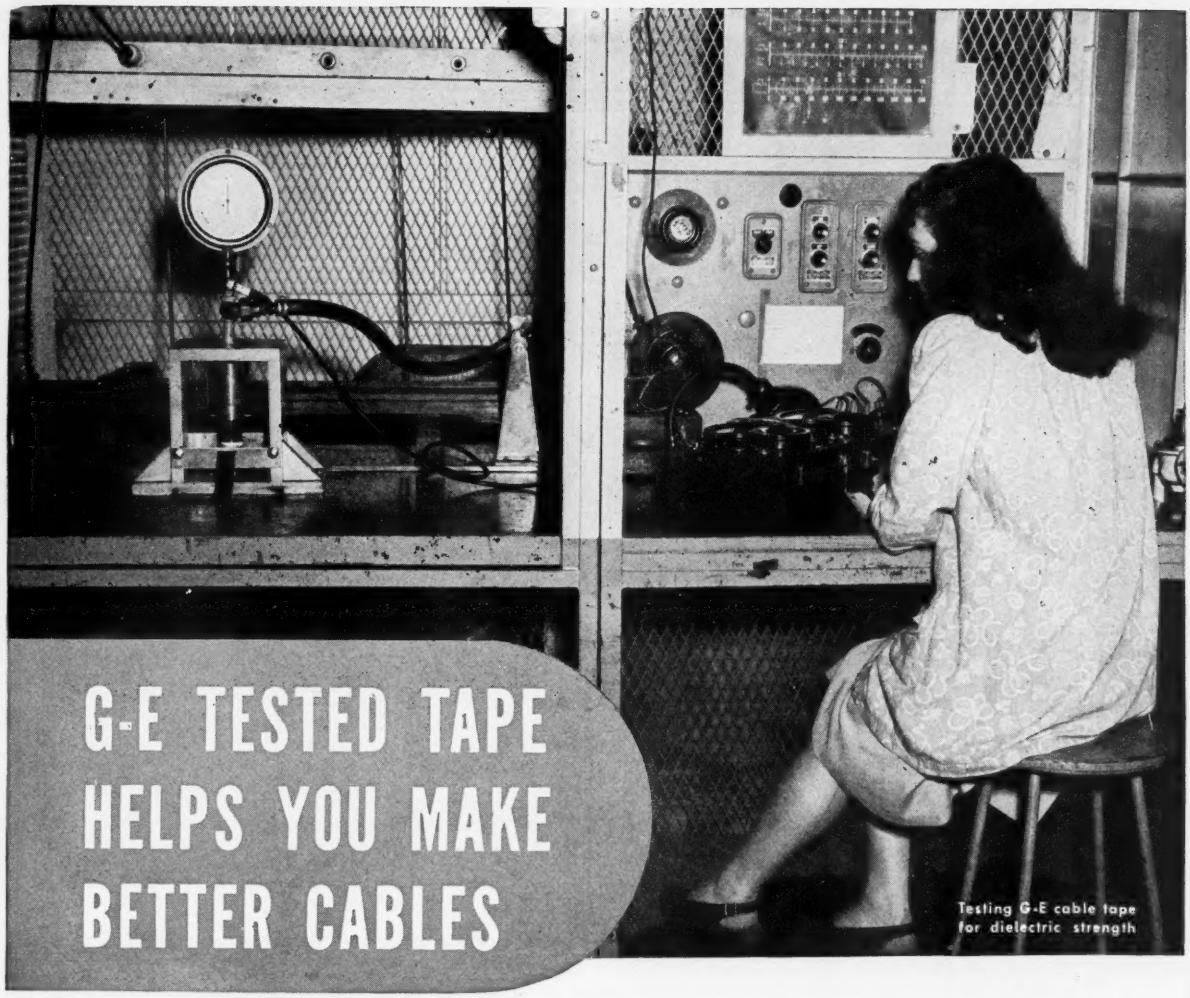
"WINCO" enamelled wire is drawn from special selected copper, assuring perfect enamelling. All wire tested before shipment.

"WINCO" enamelled wire is available in all standard and special coverings made to meet exacting requirements.

Samples of LEAKPROOF and other enamelled wires sent on request

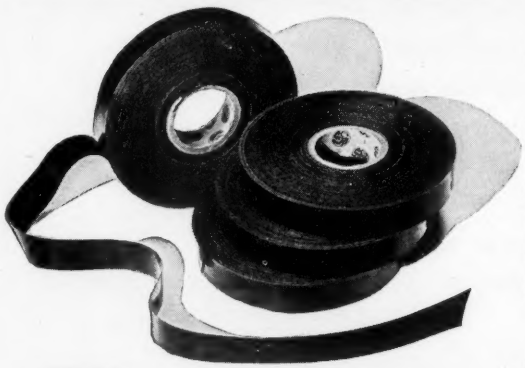
WINSTED DIVISION OF HUDSON WIRE COMPANY

WINSTED, CONN.



G-E TESTED TAPE HELPS YOU MAKE BETTER CABLES

Testing G-E cable tape for dielectric strength



CABLE TAPE

Every yard of General Electric tape is tested to help insure the insulating qualities required in your cables.

G-E tests assure the dielectric strength . . . resistance to heat, chemicals and moisture . . . tensile and tearing strength . . . thickness and evenness of application of insulating varnish . . . all of which are so highly important to good cable insulation. In addition to I.P.C.E.A. specifications, General Electric has established standards of quality which its tapes must meet.

Modern equipment . . . skilled engineers and technicians . . . "know-how" developed by years of experience . . . all combine to give you a cable tape to do the insulating job demanded of it.

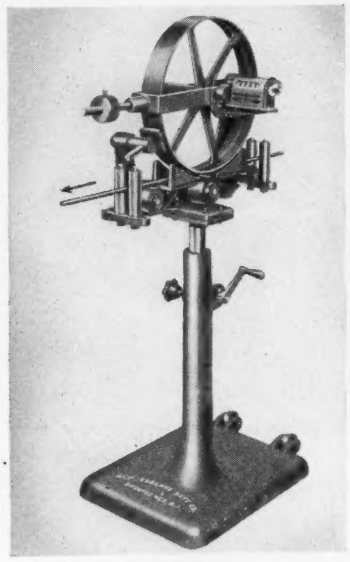
For further details write to the Resin and Insulation Materials Division, Section CG-5, Chemical Department, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

CD48-T2

WIRE MEASURING MACHINES

STYLE A



STYLE B

MEASURING MACHINES as illustrated above are built in two sizes, and can be furnished either with counter on the right-hand side, Style "A", or with counter on the left-hand side, Style "B".

THE COUNTER has plain distinct figures, can easily be set back to zero, and measures up to 100,000 feet.

PREDETERMINED COUNTERS can be supplied on either of these machines. When a predetermined length of wire has been drawn through the measuring machines, this type of counter can be arranged to stop the machine automatically. light a light, ring a bell, or operate other signal devices. This counter is equipped with a quick lever reset.

THE STANDARD, which is an optional feature, has rollers on its base to facilitate moving the machine about. Adjustment of machine to proper height is attained by means of a rack and pinion in this standard.

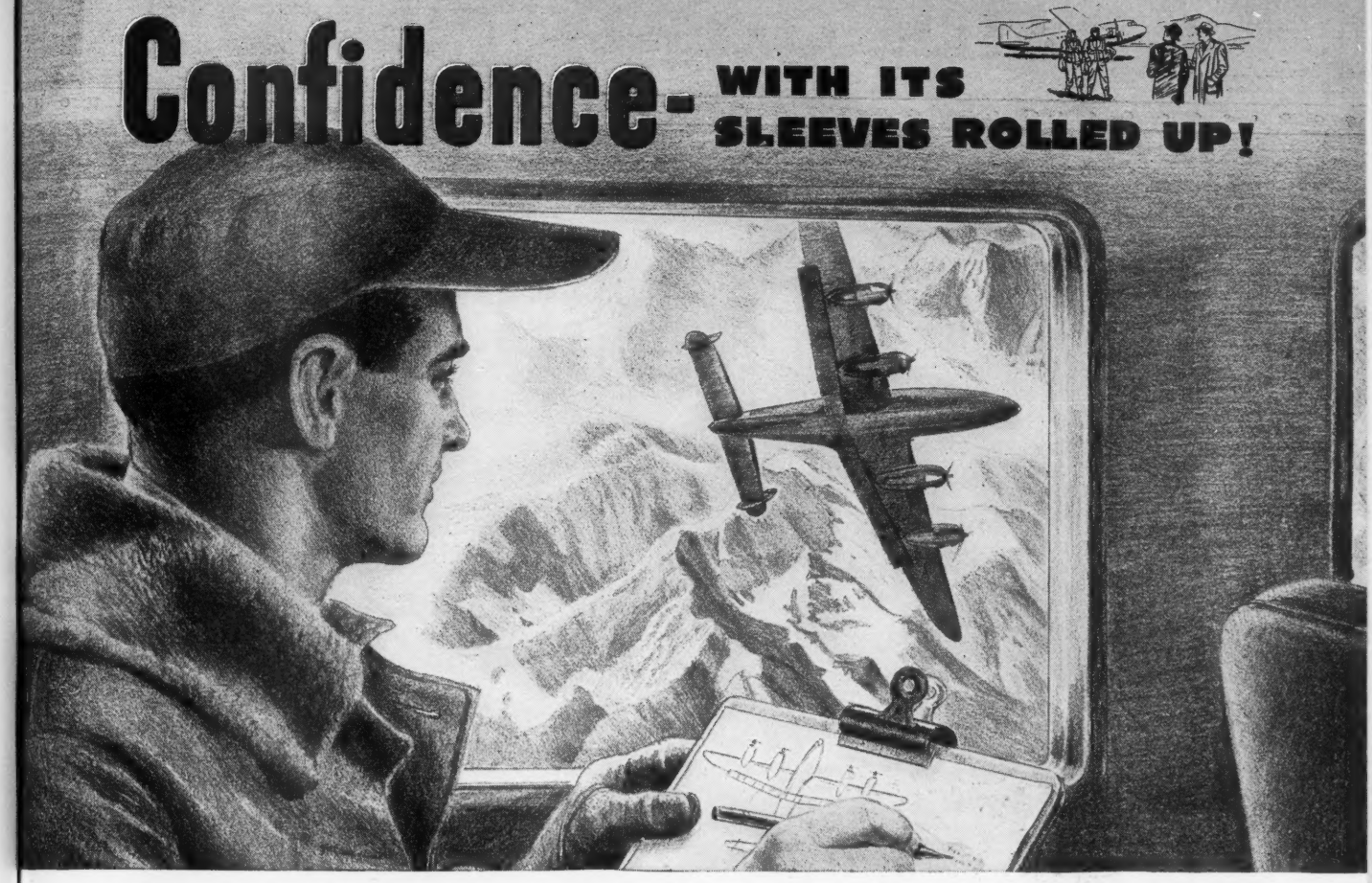
No. 1 Size — 30" circumference wheel
No. 2 Size — 50" circumference wheel

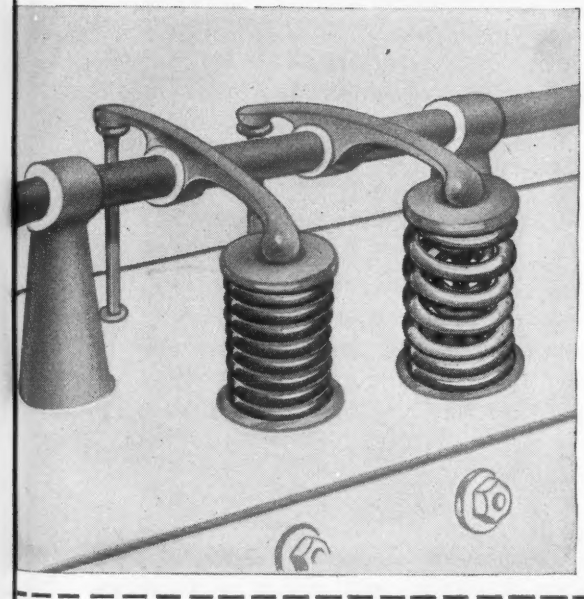
NEW ENGLAND BUTT COMPANY

ESTABLISHED 1842
304 PEARL STREET
PROVIDENCE 7, RHODE ISLAND, U. S. A.

JAMES DAY (MACHINERY) LTD., "FORD HOUSE," 88 REGENT ST., LONDON, W. 1. ENGLAND

Confidence- WITH ITS SLEEVES ROLLED UP!





YEAR BY YEAR, planes grow bigger . . . faster and safer. Man has unbounded confidence in his ability to build better and better planes. Never satisfied, he experiments and tests tirelessly, and aviation progresses.

With similar vision and confidence, Roebling has been pacemaker in the development and manufacture of products essential to the transportation and other industries. The active, widespread confidence it has won among technical men and operators throughout industry is Roebling's proudest asset. Look to Roebling for continued leadership . . . continual improvement in its products and engineering . . . continual progress.

ROUND WIRE THAT'S "FOUR SQUARE" ON THE JOB

YOU GET WHAT YOU WANT with Roebling Round Wire . . . dimensional accuracy . . . the right tensile strength, ductility and finish . . . fewer rejects. The uniform quality of Roebling Round Wire enables you to maintain an exacting standard for your product.

Meeting stringent specifications is all in the day's work with Roebling. From steel mill to shipment, every manufacturing process is positively controlled. Roebling plants and equipment are up-to-the-minute and unsurpassed. Workmen are trained in special Roebling methods and techniques developed through experience in wire making that is without an equal.

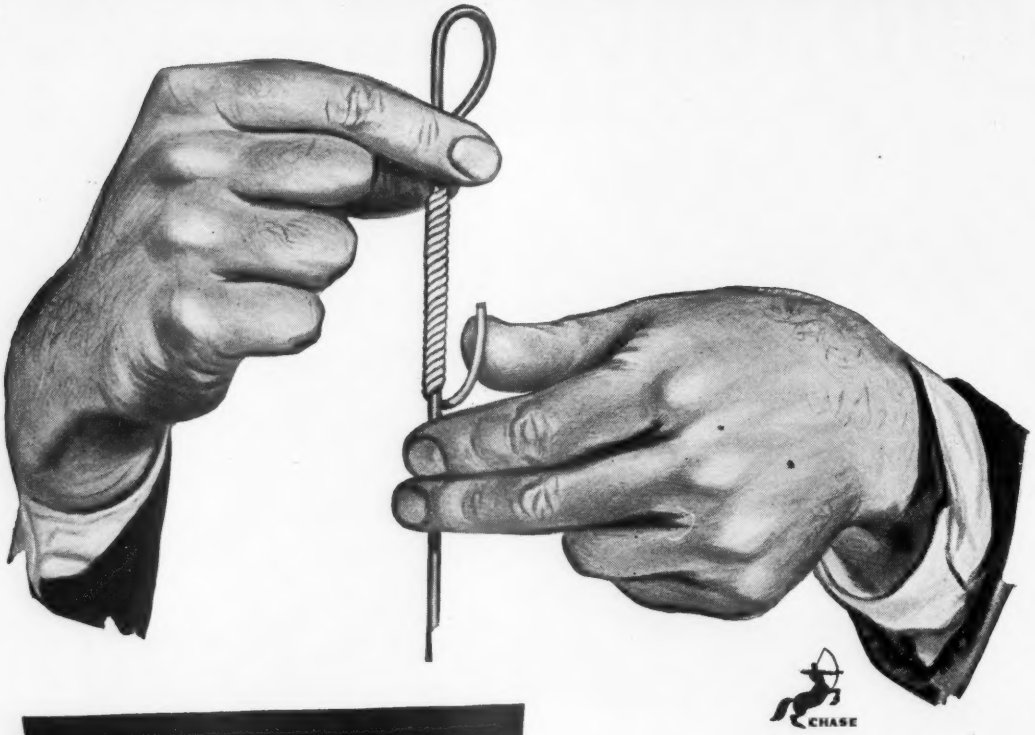
Your Roebling Field Man may be able to show you new ways of stepping up production and cutting costs with Roebling Round Wire. Simply call your nearest Roebling branch office.

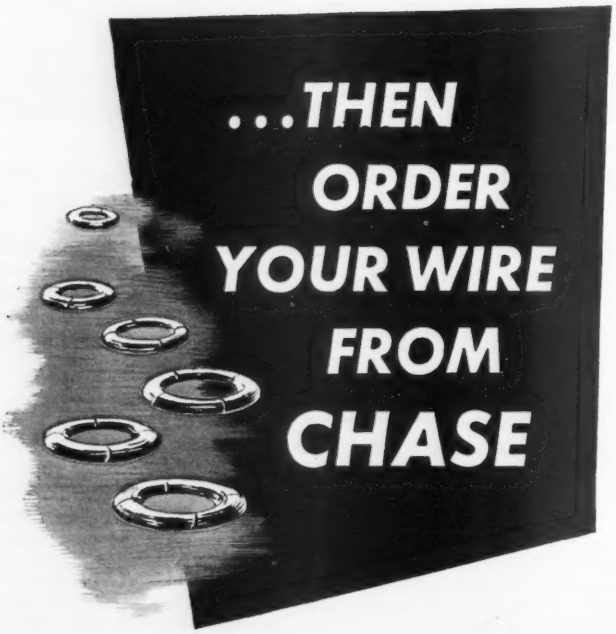
JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

A CENTURY OF CONFIDENCE ROEBLING

★ *WIRE ROPE AND STRAND* ★ *FITTINGS* ★ *SLINGS* ★ *SUSPENSION BRIDGES AND CABLES* ★ *AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS* ★ *AERIAL WIRE ROPE SYSTEMS* ★ *ELECTRICAL WIRE AND CABLE* ★ *SKI LIFTS* ★ *HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL* ★ *SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH* ★ *LAWN MOWERS*

WATCH CLOSELY PLEASE!





THIS is a test that all Chase copper-alloy wire produced for spring purposes must undergo before becoming a bona fide Chase product. It's a very critical one—which can be met only by wire of the highest quality—and consists of giving the wire a 360° coil or wrap around its *own* diameter to test its ductility and determine its physical qualities.

Every one of the 22 different types of wire alloys, regularly produced by Chase, must undergo tests that are just as rigid, or more so. And every one is carefully formulated, free from physical defects, perfectly "cast" for uniform uncoiling.

Don't compromise. Order the *best* wire from any one of the many Chase Warehouses and Service Offices from coast to coast.

Chase *the Nation's Headquarters for* **BRASS & COPPER**

WATERBURY 91, CONNECTICUT — SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . *handiest way to buy brass*

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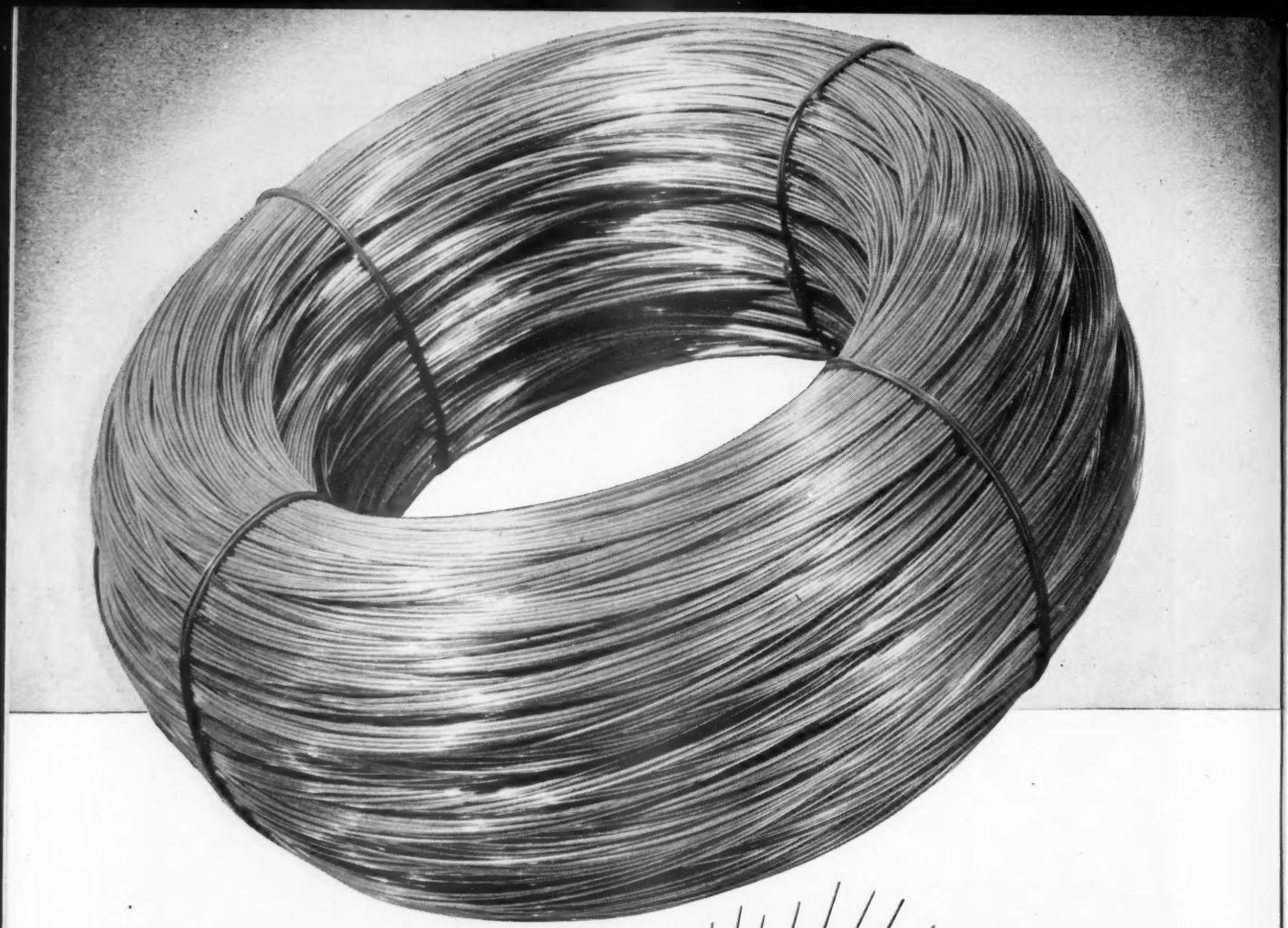

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GENERAL OFFICES • KOKOMO, INDIANA

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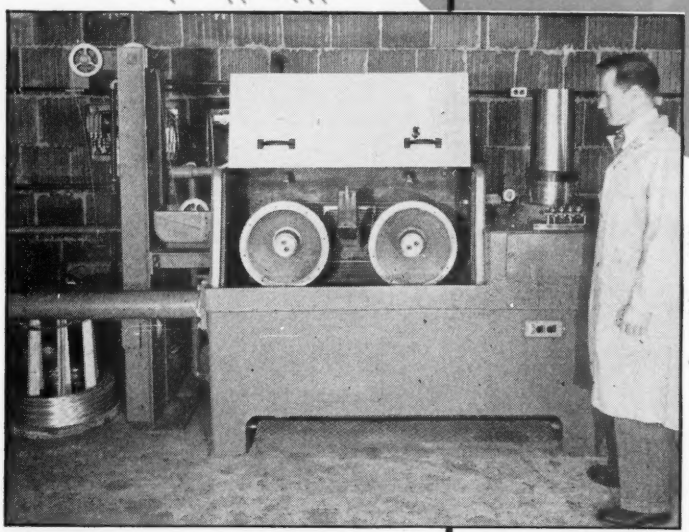

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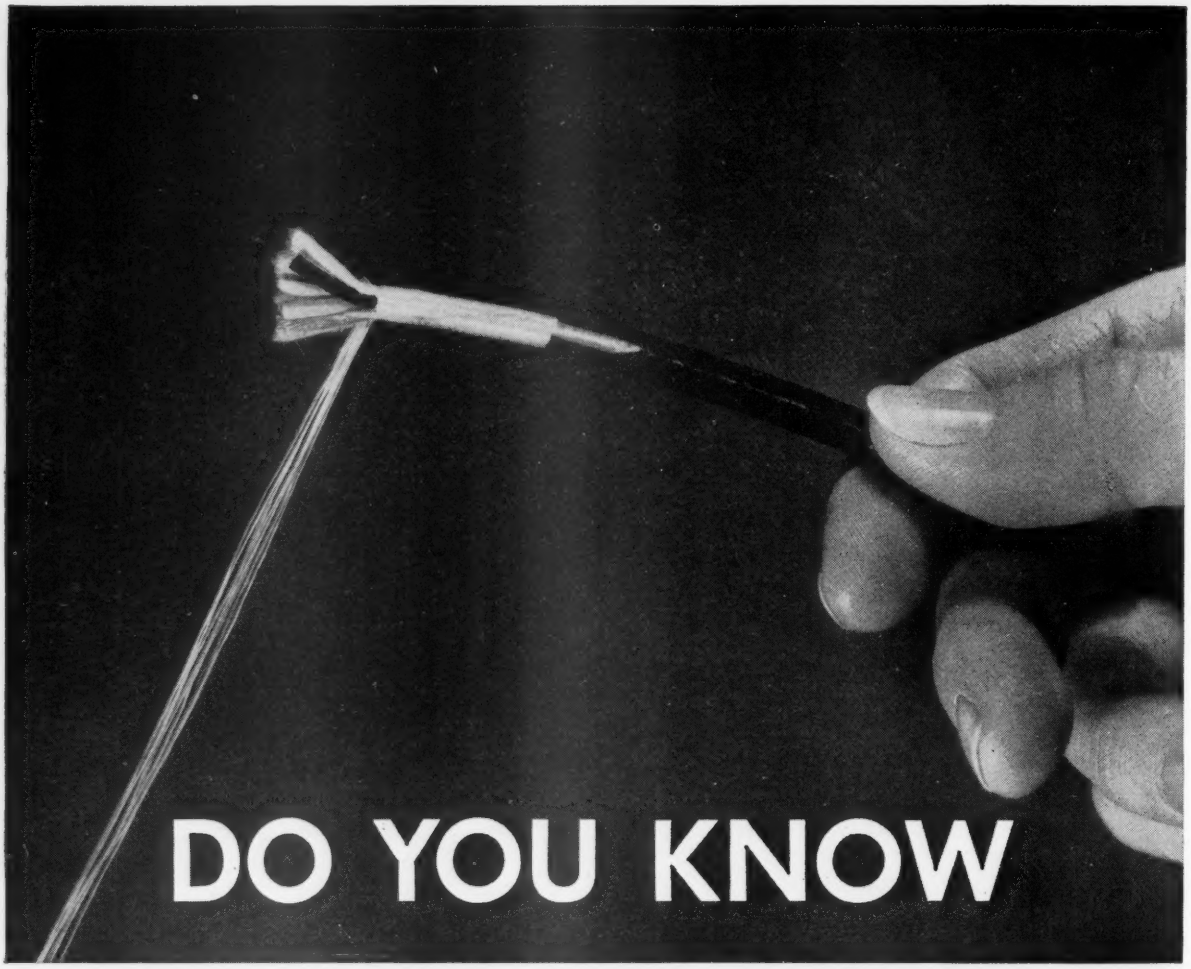
Apex Alkali Products Co.

MAIN & RECTOR STS., PHILADELPHIA 27, PA. ✦ PHONE IVyridge 3-3939



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For complete information about Fiberglas Yarns, for this and other electrical uses, write Owens-Corning Fiberglas Corporation, Dept. 875, Toledo 1, Ohio. Branches in principal cities.

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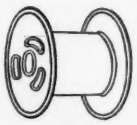
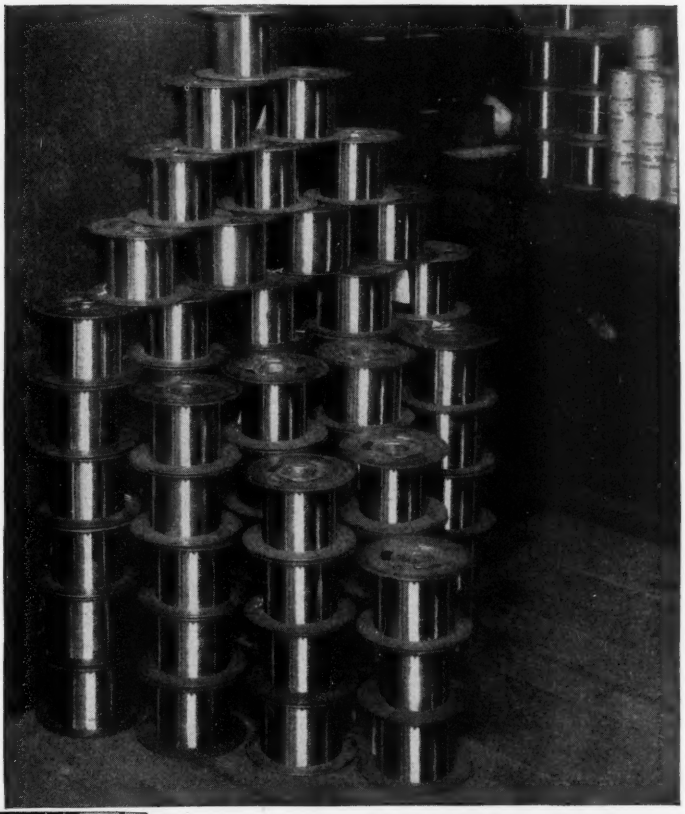
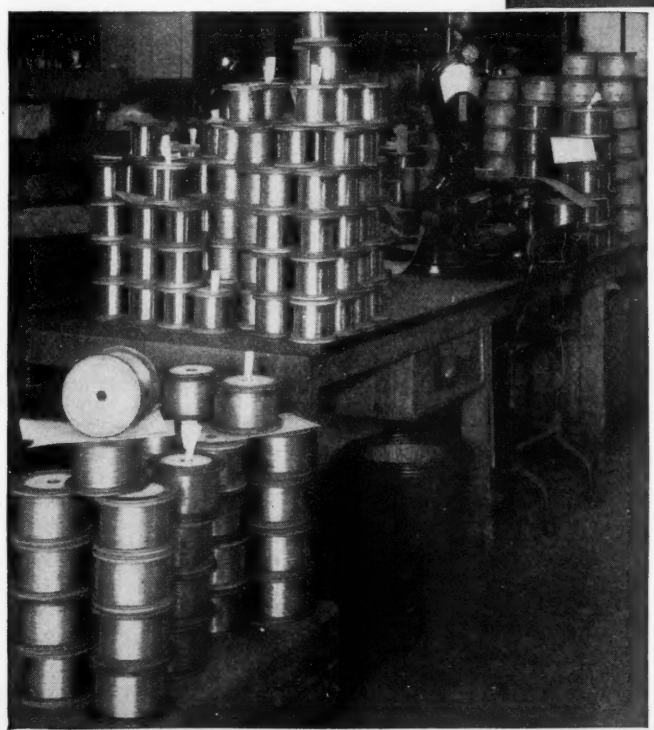
ALL-METAL SPOOLS
ruggedly built
to exact dimensions

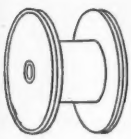


The Driver-Harris Company uses all-metal Hubbard Spools for spooling fine wire for wire recorders. Spools used in this process must not only be of precise dimensions but MUST STAY THAT WAY. Driver-Harris finds Hubbard Spools meet these most important requirements at low spool cost.





lower replacement and shipping costs



At left—Shipping spools in Driver-Harris factory spooled with Nichrome*, world famous *heat and corrosion-resistant* Nickel-Chrome Alloy Wire. This concern has used Hubbard Spools for years, having found that Hubbard light weight lowers shipping costs and strong construction withstands extreme abuse. Longer life lowers replacement costs.

HUBBARD SPOOL COMPANY

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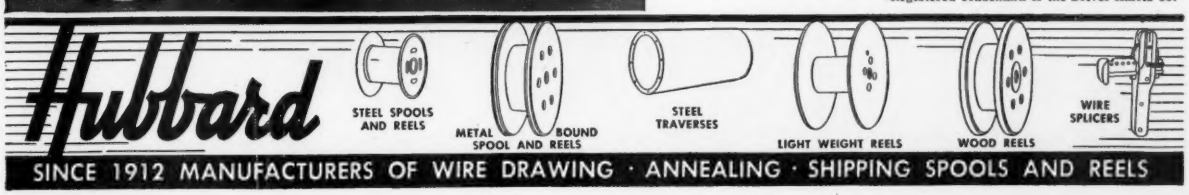
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STEEL SPOOLS AND REELS
METAL BOUND SPOOL AND REELS
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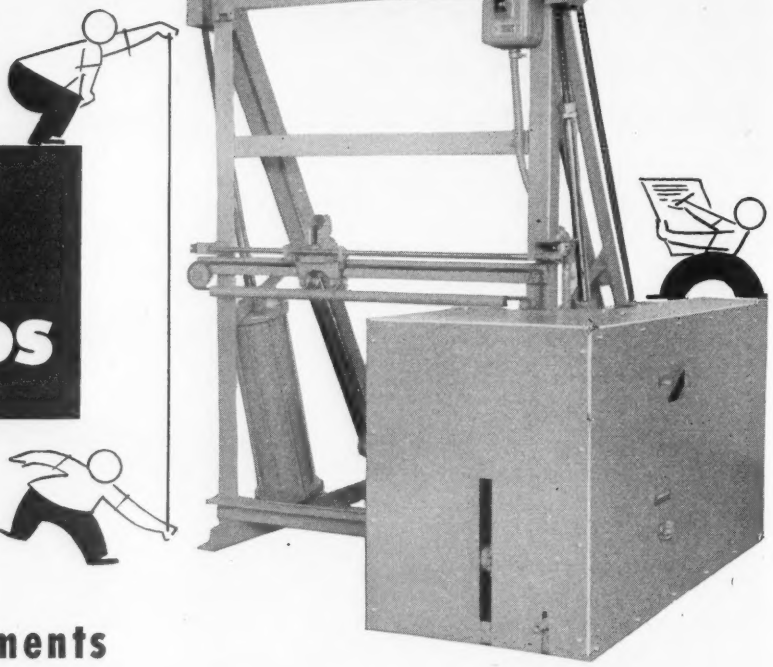
SINCE 1912 MANUFACTURERS OF WIRE DRAWING · ANNEALING · SHIPPING SPOOLS AND REELS

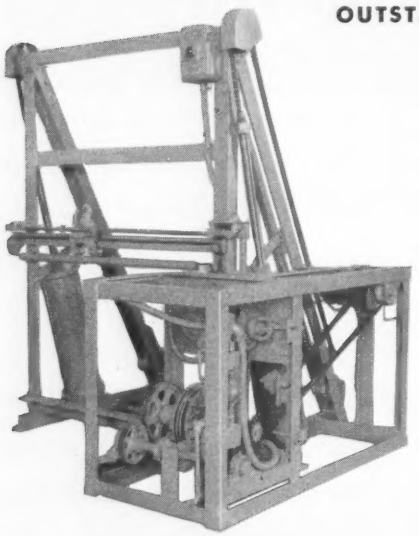
REEL Take-Ups



Shown here 24" to 48" reel capacity

Designed

To Meet Your Reeling Requirements From Standard Unit Arrangements!



48" Reel capacity take-up. External drive with slip-clutch showing drive mecl nism.

OUTSTANDING JLE REEL TAKE-UP FEATURES:

1. Complete design flexibility. Standard units easily adapted to your drive requirements!
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5. Traverse mechanism is quickly and steplessly adjustable for wire size and reel width.
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JLE TAKE-UPS AVAILABLE IN FOLLOWING DRIVES:

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Adjustable constant-reel-shaft speed . . . 4 to 1 range.
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Wide speed range available.

EXTERNAL DRIVE

Driven from capstan of any machine through slip-clutch . . . with or without *constant-wire-tension.*

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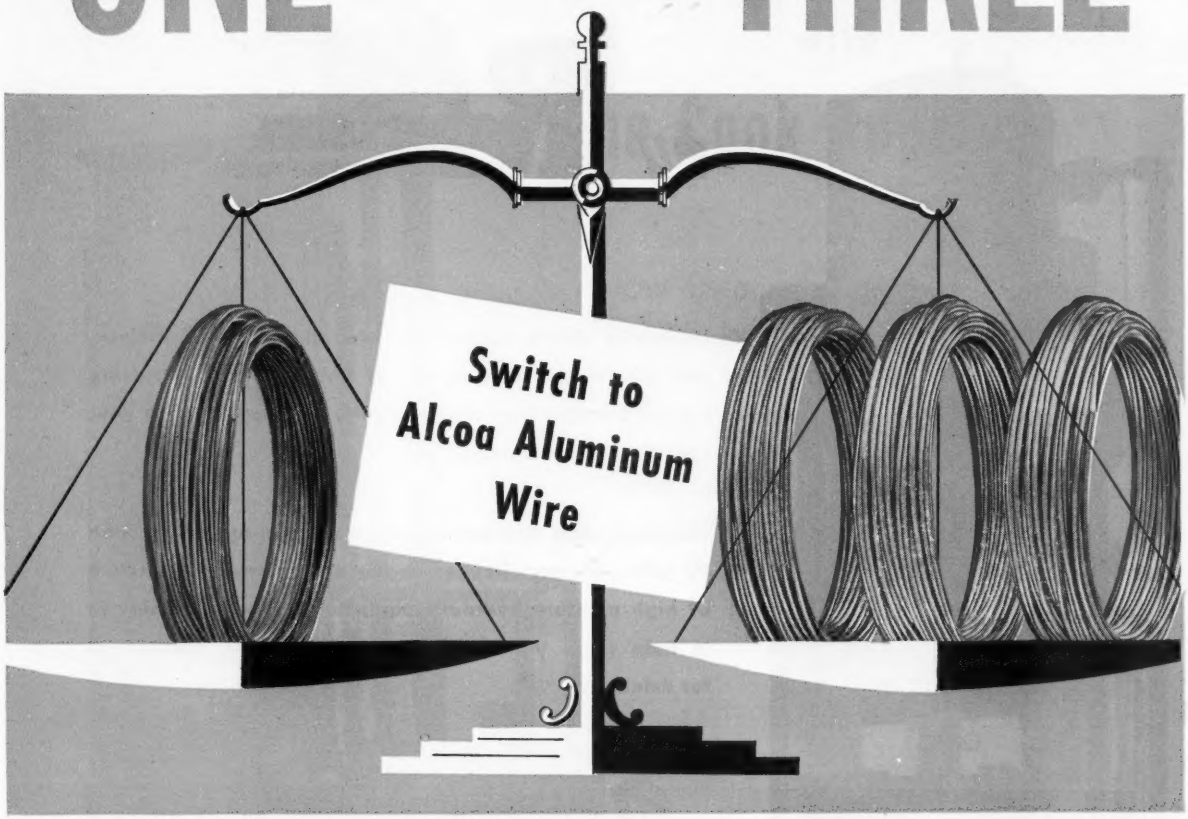
ONE WILL GET YOU THREE



One pound of Alcoa Aluminum Wire gives you *three* times as many feet as copper or steel. When you're comparing per-pound prices of wire or rod, don't forget to divide the aluminum price by 3.

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A FOOT

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WHEN YOU SWITCH
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ALUMINUM WIRE

ALCOA® FIRST IN ALUMINUM

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Uniformly steady output . . . low operating and maintenance costs are characteristic of Robertson Lead Encasing Presses because they are practically "custom-built" to your specific requirements.

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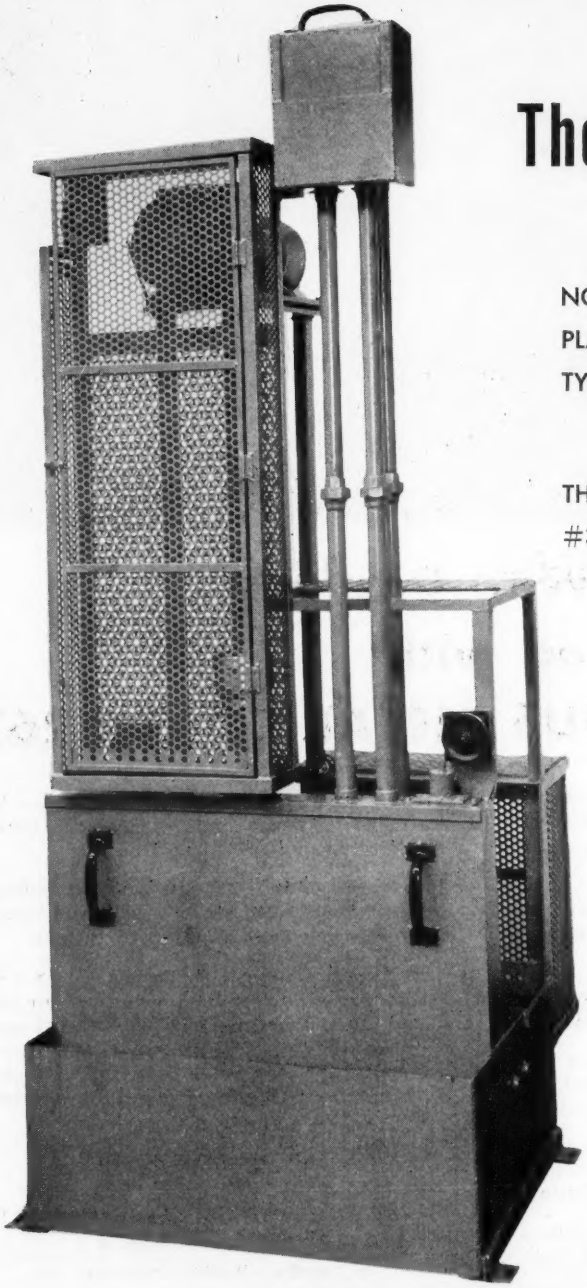
Designers and Builders of all Types of Lead Encasing Machinery

Since 1858

Anneal Copper and Aluminum Wire as They are Drawn

with

The Cook Annealer **



NOW USED IN SEVEN LARGE COPPER WIRE PLANTS. IN FOUR OF THESE, IT IS THE ONLY TYPE OF ANNEALER USED.

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SPEEDS UP TO 5000 FT. PER MINUTE.

EXTREMELY LOW POWER COST.

ALSO

CONSTANT TENSION PAY OFF STANDS* PARTICULARLY DESIRABLE FOR TUBING PLASTICS AND FOR CV TUBERS.

ONE COMPANY NOW USING TWELVE STANDS.

Annealer for #18 to #27 Copper Wire at 4000 Ft. per Minute

**Fully covered by patents.*

COOK ENGINEERING CO.

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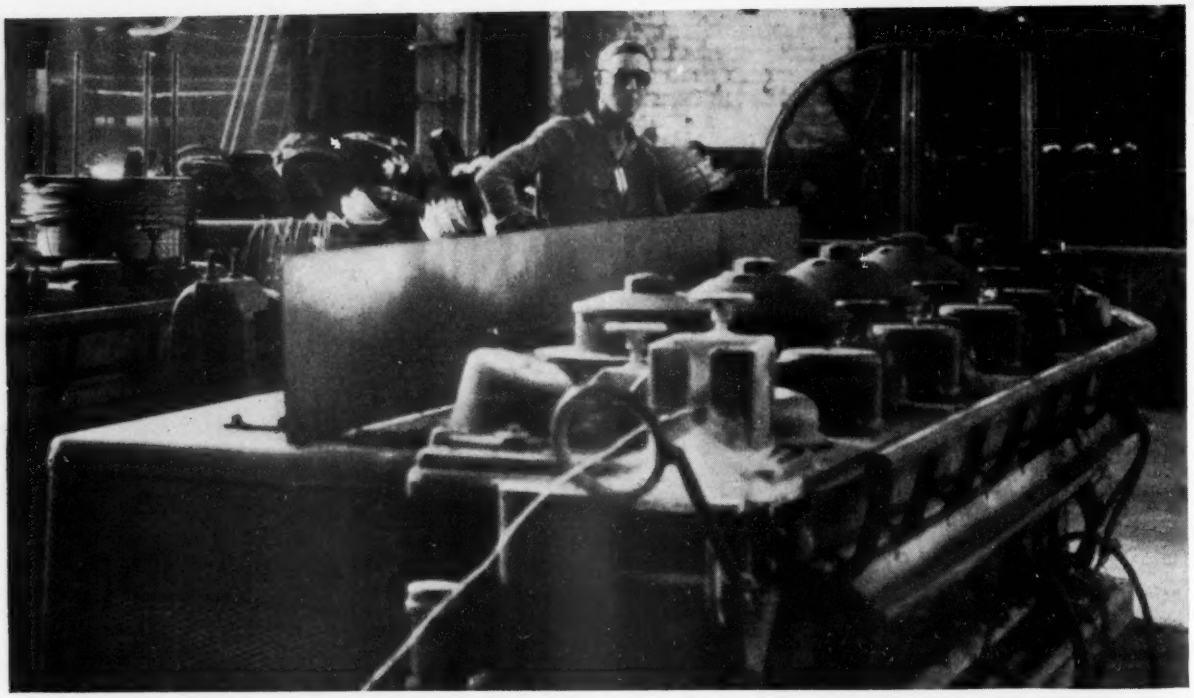

9 Improvements in Wire Drawing obtained with MAGNUS METAL COAT #267

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2. **Reduced Rejects** — rejects caused by scratching and off-size wire are virtually eliminated.
3. **Better Rust-Proofing** than was possible before Magnus #267 was introduced.
4. **Reduced Lubrication Costs** due to the fact that #267 calls for lean lubrication. In many cases savings amount to as much as 50%.
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6. **Longer Die Life** on any drawing operation, but most striking on continuous, high speed operations.
7. **No Liming or Baking** eliminates the trouble, expense and mess of the liming operation and subsequent baking.
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9. **Reduced Overall Drawing Costs** as a result of savings in liming and baking costs and the improvements in product and operations. Ultimate cost per ton of wire drawn is much less than when lime is used in spite of the much higher initial cost of Metal Coat #267.

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IN WIRE DRAWING IT'S

Magnus

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THERE are several reasons why we are able to make quality wire—free of imperfections—providing quicker, easier fabrication.

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If you make it of wire . . . make it of the best

U·S·S AMERICAN

MANUFACTURERS WIRE

USS AMERICAN MANUFACTURERS WIRE UNITED STATES STEEL

THE WIRE ASSOCIATION

will hold the

SAN FRANCISCO REGIONAL MEETING

on June 4, 1948, at the Sir Francis Drake Hotel

The meeting will start with registration at 9 a.m. for the Columbus Steel Company Plant Inspection. Busses leave the hotel at 10:30 a.m.

Dinner will be served at 7 p.m. at which Kenneth Smith, President of the California Redwood Association will be guest speaker.

The Technical Session starts at 8:30 p.m. with papers on "The Use of Wire Coating Compounds" by Harold L. Trembicki, Magnus Chemical Company, and on "Powder Metallurgy" by Herbert B. Clark, Vascoloy-Ramet Corporation. Following the papers a sound motion picture "Watts in Glass" will be shown through the courtesy of the Owens-Corning Fiberglas Company.

For information on reservation, please write or telephone Earl R. Potter, Industrial Wire Products, 2417 17th Street, San Francisco, California. Mr. Potter will serve as chairman of the meeting.

ALL PACIFIC COAST WIRE MEN ARE URGED TO ATTEND

It will be a good meeting. Please come!

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

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Tickets: $5.00 each.

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No matter how they part their hair, or where, leading wire producers depend on Standard Lubricants for faster, better wire drawing! Mill-tested for top performance, these special-purpose compounds are developed by experienced technicians to save you time, trouble, money!

If you're looking for high speed production, low operating costs and better wire finish, we think you'll find what you're looking for in the formulas perfected by Standard!

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Standard's wire drawing compounds will produce the finish you require on all grades of steel, copper, or brass: — lime bright, extra bright, dull-coated; or special finishes for welding, lacquering, enamelling or plating.

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at the point of Application

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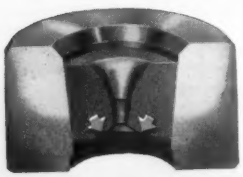

The new Rough Cored Back Relief feature designed to eliminate costly back relief cutting. Exclusive in V-R Carbide Dies.

And now, V-R again meets the specifications of industry by bringing you the new V-R carbide die with the Rough Cored Back Relief. Combined with these exclusive V-R features:

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(2) Taper-Grip Casing
(3) Extra wide front and back openings
(4) Perfect die concentricity

Vascoloy-Ramet's new die development eliminates costly time loss due to back relief cutting during refinishing and resizing operations. With the proper back relief angle built right into the die nib, chipping and breaking due to oversight is a thing of the past.

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The Wire Outlook

While business activity is holding at peak levels, a general feeling of uncertainty pervades the country. This is due in no small measure to the indecision and lack of leadership on the part of the Administration, to the threat of a new spiral of wage and price increases and to doubt as to whether free enterprise can be maintained in Europe.

One of the amazing bits of news that has recently become current, after the ERP was "put over", is the degree to which European countries have already recovered from the shock of war. While Europe lacks food and dollars, manufacturing output is in most cases at higher levels than in 1940, from 85% to 128%, arousing widespread question as to why so many billions are needed to further enhance production facilities that have so well succeeded in topping previous records.

We have started to re-arm, an expensive, but necessary step. Unless Russia backs down, the present pace of preparation for national defense will be accelerated, which may once again require the allocation of many materials late this year.

The steel expansion program, the effects of some of which will be felt this year, will entail a total expenditure for enlarged facilities and new equipment of 1.7 billion dollars. Just short of $500,000,000 was spent in 1947, $565,000,000 will be spent in 1948, and $265,000,000 is so far earmarked for new machinery and expansion in 1949.

Manufacturers of wire equipment, although they are shortening delivery dates this year very generally have constantly growing backlogs. The U. S. Steel Company estimates that the tools for workers, wire drawing equipment and so forth, have increased 91% in cost over 1940's prices. This is a natural consequent of the raw material and wage price boosts that we have already had. A new cycle of wage demands would simply delay the day of equilibrium and is to be deplored—avoided, if possible Some machinery people cannot see the present demand for equipment continuing indefinitely, but the end is not yet in sight.

For many types of wires, particularly non-ferrous metals, the day of ringing doorbells for business has definitely arrived. Probably a healthier state of business would exist everywhere, were all manufacturers faced with the need to go out and sell. Many types of consumer goods manufacturers are accumulating huge inventories of finished products and these must be moved—or else. A common answer is that consumers are not buying, (1) because of high prices and (2) because of uncertain conditions. Coherent leadership and policies in Washington would do much to restore confidence.

High carbon spring wire demand has been increasing, particularly for automotive uses. Buyers of low carbon wire are operating on low inventories, which in many cases also means inadequate supplies. Wire products, such as nails and fencing, are in very short supply. Pressure on fine wire manufacturers continues unabated, although for coarse wire the need has become acute. Wire rope is in an easy position, due largely to the expanded facilities developed during the war. Cold heading wire continues scarce. Upholstery wire demand is heavy in some parts of the country and easier in others, but overall is tight. Specialty wires, particularly music wire, can be had fairly promptly.

Aluminum has made heavy inroads on steel in the last two years, many users having become so sold on it that it is believed much of the business will "stick" even after steel becomes plentiful. Its uses are varied and constantly growing.

Tin production estimates are for 160,000 tons this year, 55% of which will come in the second half. About 90,000 tons of this will be available for allocation this year, practically double the amount allocated in 1947.

Copper demand continues at peak levels, especially from wire and brass mills, with the supply reasonably ample.

Brass mills are perking up and report some difficulty in getting all of the copper and zinc, especially Prime Western and High Grade, that they require.

Of all the non-ferrous metals, lead is the most critically short. The let-up in the battery industry has failed to improve supplies elsewhere.

Many economists are still anticipating a recession of moderate proportions. It probably would be healthy, but if it comes, it will be the result of apprehensions, rather than from basic economic conditions, as the underlying needs for the products of industry are not going to be satisfied for a long time to come.

—from the Editor's Desk

Are certain of your wire machines penalizing production–cutting into profits?

Some wire mills have a few machines that are slow and require more than their share of attention. These few machines confuse the cost picture . . . sometimes cloud the real benefits obtained from the more modern machines. Do you have laggards in your mill? Plan now to replace them with Morgan-Connors

. . . watch production go up . . . costs come down.

WM-25

MORGAN-CONNOR
WIRE MACHINES

MORGAN CONSTRUCTION COMPANY WORCESTER, MASSACHUSETTS

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 23 MAY, 1948 No. 5

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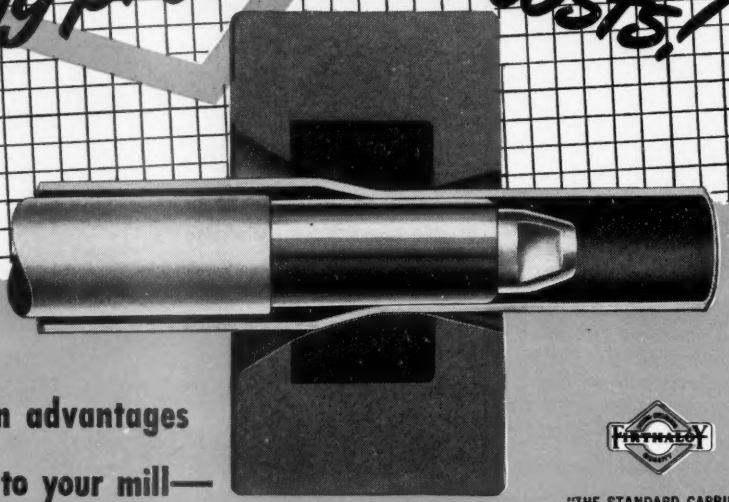

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Continuous Annealing of Soft Drawn Copper Wire

By Leonard O. Walde

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Mr. Walde studied Electrical Engineering at the University of Wisconsin and then attended the University of Montana, School of Mines, where he graduated with the degree: Engineer of Metallurgy. He has been identified with the wire industry for the past twenty-five years and has had experience in almost every phase of electric wire and cable production.

MOST insulated electrical wire and cable requires soft annealed copper conductors. This is particularly true for Mining Machine Cable, portable cords, welding cable, as well as building wire and power cable for indoor, underground and shipboard use. In the annealed state copper has its maximum electrical conductivity. The flexibility obtained by annealing makes possible the manufacture of cable that can be easily handled in the normal course of installation.

* * *

THE operations that follow wire drawing are many and varied. These include annealing, tinning, bunching, stranding, enameling, and insulating. Each one presents its own group of problems; many of which can be simplified by starting with wire of uniform size, properly annealed and reeled for trouble-free processing.

* * *

THE advantages of annealing wire before it is wound on to reels have long been apparent to those who have had experience with tarnished, sticky or non-uniformly annealed wire so frequently produced when wire is annealed on reels in the various enclosed chamber types of furnaces in general use. Wire that has been properly annealed and cooled before reeling can be further processed with a minimum of difficulty.

* * *

ONE of the earliest methods, and one still used extensively, is to draw and anneal the wire in coils and then spool for further processing. This involves considerable time, extra handling, the use of annealing furnaces and auxiliary spooling equipment along with the required additional labor. All of these factors lead to high cost and extensive floor space requirement. However, uniformly high quality work is possible by this method, provided all of the factors involved are properly controlled.

ANOTHER method consists of drawing the wire in coils or on reels, and then passing one or more strands through a suitable annealing furnace. With good reeling and annealing equipment excellent results may be attained. This, too, involves extra equipment and extra handling.

* * *

OBVIOUSLY, the most desirable way to obtain uniformly annealed wire, properly wound on reels would be to combine the drawing and annealing, thus eliminating unnecessary equipment and reoperations that are required when other methods are used.

* * *

THE process, which is covered by patents, was developed by the **Cook Engineering Company** for annealing copper wire in conjunction with the wire drawing operation eliminates the excessive time, extra handling and large amount of floor space required for conventional methods. Through the use of continuous reelers along with rod welding, machine efficiency is increased because stops for reel changes are eliminated. The process under discussion involves the application of resistance heating to the wire during its passage from the wire drawing machine to the reeler.

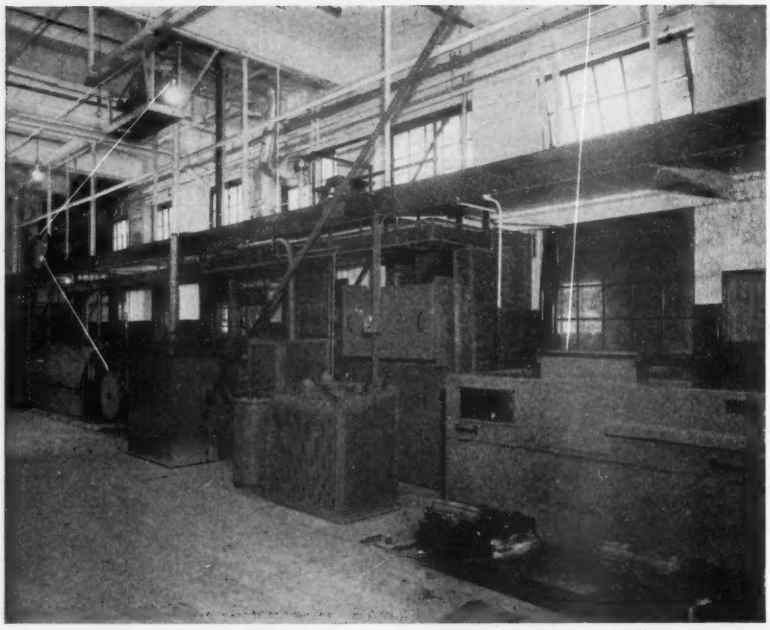

Fig. 1. — 13 Die Syncro Machine at extreme left

* * * *

THE photograph (Fig. 1) shows a general view of a thirteen die wire drawing machine that has been equipped to draw, anneal and reel copper wire continuously in finished sizes ranging from .040″ to .102″ at 3100 feet per minute and .114″ to .144″ at 2000 feet per minute.

* * *

IN this machine each rod coil is butt welded outside of the safety cage (Fig. 2) and is pushed onto the turntable in time to take the place of the one that has run out.

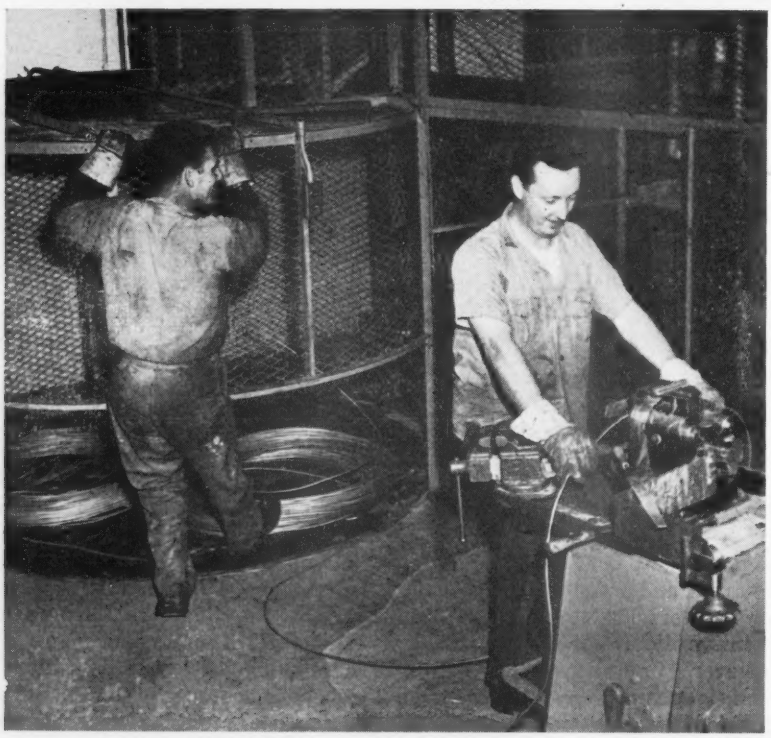

Fig. 2. — Joined Rod Coil being placed on turntable

* * * *

* * *

THE turntable is motor driven for ease in positioning the incoming coil and is rotated in a counter-clockwise direction to reduce the possibility of tangling the rod as it enters the machine.

* * *

AFTER passing through the wire drawing machine the wire is looped around an electrode sheave (Fig. 3) that is driven from the capstan shaft of the machine and is connected to one of the secondary taps of a three phase, delta connected transformer.

* * *

THE motor driven electrode sheave directly over the entering end of the machine is connected to a second transformer tap. A third motor driven electrode sheave is mounted directly over the vertical steam tube and is connected to the third tap of the annealing transformer. A fourth electrode sheave is located in the bottom of the cooling water tank and is connected to the same transformer tap as the first one described, thus completing the circuit.

* * *

THE wire is preheated preparatory to annealing during its passage from the first electrode sheave to the one over the steam tube.

* * *

THE wire reaches the annealing temperature while passing through the insulated tube into which a small quantity of steam is introduced to exclude the air so that it will not tarnish.

* * *

THE cooling water tank is so built that the wire passes through approximately two feet of water before reaching the sheave that directs it into the diagonal cooling pipe. This pipe leads the wire to an overhead tension sheave directly above the reeler.

Editor's Note: In Figures 1, 5 and 6, since the fine wires did not show in the photographs, lines have been drawn to indicate the wire paths.

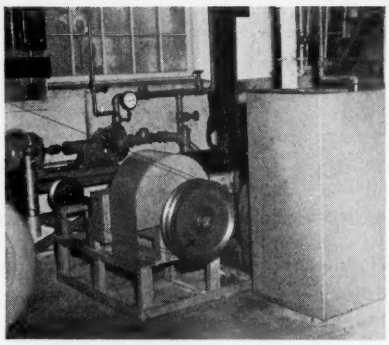

Fig. 3 — Showing Electrode Sheave that is hidden behind Water Tank to right of Drawing Machine in Fig. 1 * * * * *

THE wire enters the top of the continuous reeler, (Fig. 4) which consists of two reelers with overhanging shafts so mounted that the flanges of the two reels are about one quarter of an inch apart. When one reel is filled the incoming wire is flipped to the empty one without stopping the machine. After the full reel is discharged, an empty one is put in its place so that the operation can be reversed, thus completing the sequence of welding the rods, drawing the wire, annealing and reeling continuously.

* * *

THE primary of the annealing transformer is so connected through selector tap switches, that the voltage can be adjusted to the requirements of the various sizes of wire to be drawn. It is also possible to vary the voltage in each phase to obtain the desired degree of preheating required to maintain bright wire and uniform annealing.

* * *

Fig. 4. — Take Ups for continuous reeling.

ALTHOUGH copper does not lend itself to heat treatment in the accepted sense, the degree of anneal may be controlled to some extent, which is an advantage where there are numerous subsequent operations.

* * *

OUR statistical quality control analysis shows that this non-stop process consistently produces very uniform wire with respect to tensile strength, elongation and gage. The finish or brightness of the wire is under constant observation and is controlled by means of adjusting the tap switches.

THE photograph (Fig. 5) is that of a twelve die Intermediate Wire Drawing Machine for finishing sizes from .040″ to .016″ at 4000 feet per minute. In this case the annealing unit, which is shown between the machine and the reeler, is more compact than that of the rod machine because less wire is required in the preheating and annealing circuits. Because of the lower power requirements a single phase circuit is used. The electrode sheaves are located at the top and bottom of the unit with the cooling

(*Please turn to page* 425)

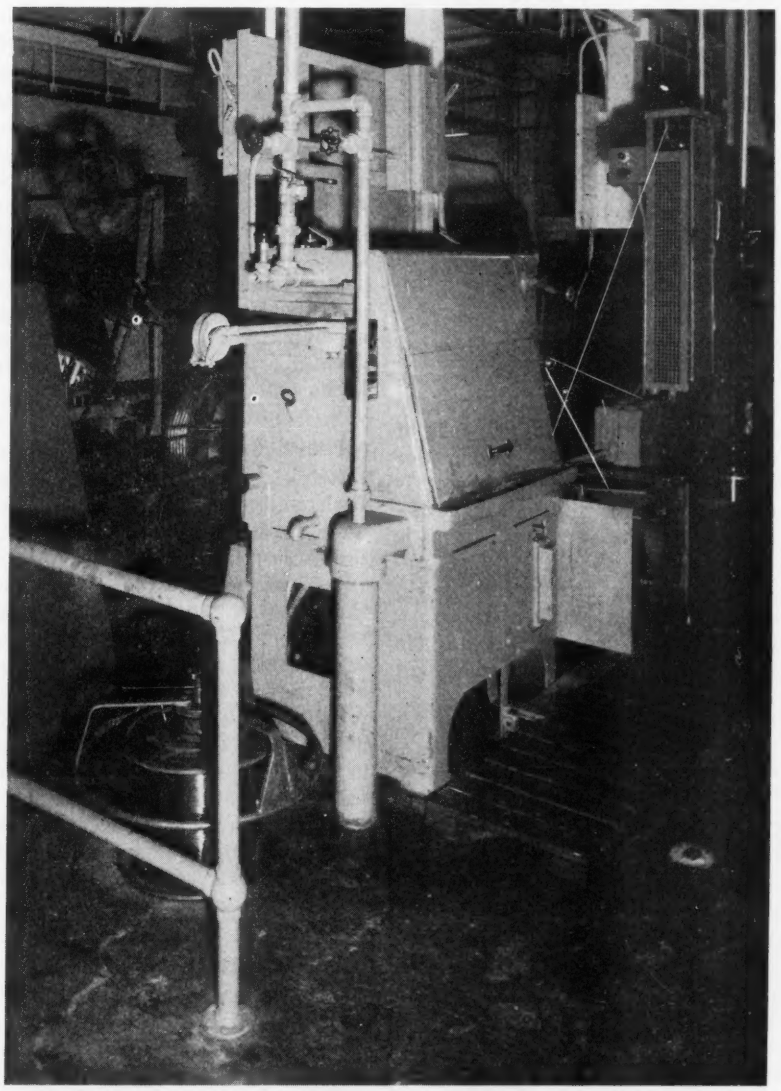

Fig. 5. — 12 Die Syncro Intermediate Machine * * *

WIRE FORMS

By Herbert Chase, M.E.

Forest Hills, N. Y.

Part II

Part I was published in the April, 1948 issue of WIRE & WIRE PRODUCTS.

Material Selection

AS for other high production items, the material chosen should be not only that which meets service requirements but one that is well adapted to fabrication in the machine or machines to be used in shaping the product, for only then is highest economy in manufacture likely to be achieved. An important factor in this connection is the type of finish required because, especially if a finish must be applied after fabrication, its cost may exceed that of the unfinished wire form itself. In other cases, say where a simple immersion treatment or barrel plating are feasible, finishing after forming may cost very little.

* * *

SINCE precoated wires that meet many service requirements are available and such coatings usually add relatively little to the cost of bare wire, it is well to consider the use of precoated wire if it is certain that this finish will prove adequate **when the wire form is completed.** It should not be forgotten, however, that severe working may weaken or even destroy a finish applied before working is done and that such a finish will not cover areas where the wire form is sheared or otherwise cut during fabrication.

* * *

IF no finish is to be applied after fabrication, the material selected should be such, of course, as will give satisfactory service under the exposures for which the wire form is intended. If corrosion is likely to be encountered, the degree of resistance should be sufficient to avoid failure within the service life anticipated. This is of special importance in the case of springs or other parts subject to high continuous or intermittent stresses or where shock loading is encountered.

* * *

OF the ferrous alloys suited for wire forms, annealed low-carbon steel is easiest to work and is satisfactory for a large range of uses. From a forming standpoint, the softer grades of wire are always preferred, because they form easily and give minimum springback. The latter is important especially where close dimensional limits are specified because, as hardness increases, springback is greater and dimensions may be harder to hold within limits set.

* * *

IN designing dies used in forming, it is essential to allow for **springback** and, since springback varies with the hardness of the wire used the designer of tools needs to know what hardness is essential and whether it is to be secured by using a wire already hardened or by using a soft wire that can be hardened later. The latter is easier to form and causes less wear on tools, as a rule, but, if heat-treatment is needed after forming, the chance that warpage may occur has to be considered and the effect of heat-treatment upon dimensions and upon finish is often of paramount importance.

* * *

REFORMING, if needed after heat treatment, can be done but may add so much to cost that it often is better to work with prehardened wire so that heat-treatment after forming can be avoided. If heat-treatment spoils the finish or affects the degree of brightness more than is permitted, finishing after forming is likely to be necessary and adds that much to costs.

* * *

BECAUSE the amount of springback can only be estimated, it is often necessary to alter forming dies after they are built to adapt them to the particular wire used. Unfortunately, too, hardness often varies from coil to coil and even within the same coil. Hence, especially when close dimensional limits are essential, it may even be necessary to alter or reset tools during a given run.

* * *

SUCH considerations may or may not affect the designer but they do affect the grade of wire chosen and finish selected and thereby influence costs. Often, it is better to leave the choice of wire to the maker of the wire form, provided it is certain that the grade chosen will meet service requirements. Clearly, however, it is advantageous to all concerned to discuss the design of the piece with the producer of the dies and of the wire forms themselves and to choose the wire according to a mutual understanding, especially as certain qualities are hard to specify precisely even when a particular specification seems to be essential.

* * *

NATURALLY, there are some limitations on the severity of working that a given wire will withstand. A sharper bend, for example, is feasible in soft ductile wire than in one that is harder and less ductile. In consequence, if severe working is essential, the designer should make sure that the wire specified will withstand such working without failure or unwarranted expenses.

MANY wire forms are produced from hard-drawn steel spring wire or from music wire worked in the hardened form partly because such wire has the physical properties needed to act as a spring. In such cases, however, the design must be such that forming to the shape needed is feasible and is not excessive in cost. Springs are also made from stainless and other alloy steel wire or ribbon as well as in many non-ferrous alloys.

* * *

IN some cases, where heat treatment alone will not yield the desired hardness or spring characteristics, it is essential to employ a wire obtained and formed in work-hardened condition. Phosphor bronze, hard drawn brass and monel metal are among non-ferrous alloys suitable for springs and for some other wire forms.

* * *

THERE are, of course, many copper alloys and other non-ferrous alloys obtainable in wire or ribbon in various degrees of hardness and that are well adapted for particular wire forms. Pure copper is often chosen for applications where current carrying is an important requirement. Certain copper alloys containing small amounts of beryllium are exceptionally good for some forms of springs in which long life and high fatigue resistance is required.

* * *

EXCEPT where some special requirement, such, for example, as special forms of corrosion resistance or low electrical resistance is required, however, steel wire or ribbon, with or without coating, is the common choice because such stock is low in cost besides having excellent mechanical properties. One important supplier of such wire and also of non-ferrous wire ranks them as follows in order of commercial importance:

* * *

WHERE spring action is needed or high hardness is necessary for other reasons:

High carbon (0.41 to 0.85%) pre-tempered steel
High carbon (0.41 to .70%) untempered
Annealed high carbon
18-8 Stainless steel
Non-ferrous alloys

WHERE no spring action is needed.

Hard drawn basic or bessemer (low carbon)
Annealed low carbon
Stainless steel
Non-ferrous alloys

* * *

WIRE and ribbon are commonly supplied without coating but often with a bright finish. Pre-finished coatings, in order of commercial importance, are: zinc, copper and tin but enameled or equivalent finishes are gaining in extent of use. Commercial thickness of metal pre-coatings is 0.0003 to 0.0005 in. but thicker coatings can be had at higher prices.

* * *

COATINGS applied electrolitically after forming include zinc, cadmium, tin, copper, brass, nickel, chromium and others. Oxide and phosphate coatings, applied by immersion and subsequently oiled or enameled are often specified and can be made to yield quite high corrosion resistance if the work is properly done and coatings have adequate thickness. Enamels, japans, and other organic or synthetic finishes, some of which have remarkably good adherence, are used but both adherence and corrosion resistance are commonly much improved by phosphate treatment or certain other immersion treatments, especially on steel with or without zinc pre-coating.

* * *

IN the case of electrolytic coatings, which are always somewhat porous, the degree of corrosion resistance or protection afforded usually depends, for any given metal, upon the thickness of the coating. Many electrolytic coatings that are bright without buffing are now available but commonly have to be applied to a surface that is smooth and bright if a finish of high luster is required. Certain types of tumbling or barrel "finishing" can be made to yield a bright surface well suited for bright or other electroplating.

* * *

WIRE diameter is commonly specified by **American Steel & Wire Co.** gage number (formerly known as **Washburn and Moen**), but is subjected to some size variation as indicated in Table A. (See below).

* * *

FOR cold rolled strip (ribbon) steel, tolerances run from ±0.005 in. on stock up to ¼-in. thickness and ±0.001 in. on stock down to 0.010 in. nominal thickness. In respect to width, the tolerance varies with the shape of the edge specified.

* * *

ROUND wires are commonly ordered according to tensile strength range rather than by hardness number and the tensile strength spread between maximum and minimum permitted is 10,000 to 20,000 psi, as a rule. For strip (ribbon) steel, there are five hardness grades as follows:

No. 1, HARD — for flat work only.
No. 2, HALF-HARD — will take right angle bend across grain without fracture.
No. 3, QUARTER-HARD — will bend back upon itself across grain and fairly well with grain.
No. 4, "PINCH PASS" or "skin roll".
No. 5, DEAD SOFT — will bend back upon itself with or across grain.

* * *

WHEN pre-tempered steel strip or ribbon is ordered, the heat-treatment, for a given carbon content and a given thickness, is such that a given hardness is realized. Strip that requires a "special" pre-temper can be secured but may result in delay and higher price than for a "standard" temper.

* * *

PRACTICE in respect to dimensional tolerances and hardness of non-ferrous strip is likely to vary considerably with the alloy

TABLE A

	Diameter in inches		
Drawing	½ and coarser	½ to No. 14½ (0.076)	Finer than No. 14½ to No. 20 (0.034)
Regular	±0.003	±0.002	±0.001
Semi-special	±0.002	±0.0015	—
Special	±0.0015	±0.001	±0.0005
Extra Special	±0.001	±0.0005	—

and with the supplier and should be checked with the supplier, especially if close limits or a special hardness grade is considered essential. If severe working is required in producing the wire form, its hardness will be increased, of course, where this working is done.

* * *

Production Considerations as Affecting Design

WITH wire forms, as with other products intended for quantity production, the more the designer knows about production methods the better should he be able to design a given part to adapt it for ready and rapid fabrication. Much can be learned by observing wire forming machines during setup and production, by noting features of design that result in delays or help to avoid them and by discussing these and related items with supervisors, tool designers and those concerned with quality control, finish and related items.

* * *

THE simpler the tools, the easier they are to set up and the fewer delays they involve, the lower tooling costs will be. Fussy details that make for delay should be avoided but reasons for delays may never become known to the designer unless he visits the shop or employs other means of learning which features of design facilitate and which delay production.

* * *

CERTAINLY it is better to specify a material that is stocked or easily secured than to order some other unless it is **essential** to obtain given results that are sacrificed unless a "special" material is employed. Similarly, if a "special" surface or unusual pre-finished stock is specified, it is well to make sure that the benefits derived are well worth whatever delays or added costs are entailed.

* * *

IN short, nothing should be required that alters properly established shop routines unless there is an excellent or compelling reason for the departure and good ground for incurring whatever extra costs are involved. Frequently, seemingly minor changes in specifications have a decided effect upon production or time of delivery or both and such changes often can be permitted without any significant effect upon the serviceability or satisfactory performance of the product.

* * *

UNLESS the designer is certain that a special shape or size of wire form is needed for a given application, he may well make suitable inquiries about shapes and sizes available from stock dies. Some producers have several hundred or even thousands of stock dies and, if any such dies can be utilized, considerable investments in new dies and in delays for making them can be avoided.

* * *

THERE are no well recognized rules for the design of wire forms but those given below should have fairly general application **where the objective is to secure a satisfactory product at minimum cost.** Naturally, these rules are not universal in their application, that is, they are subject to exceptions, but where they can be followed without undue sacrifice on essential scores, benefits in respect to over-all costs may be anticipated:

* * *

Rules for Design

1—**SEE that the sectional area and length of stock (wire or ribbon) required are kept at the minimum consistent with strength and stiffness needed and with proper performance of functions required.** By following this rule, the weight and cost of stock will be minimized and it probably will be possible to use the lightest and fastest machine that is available for the job. Both of these should help to keep costs at a minimum.

* * *

2—**KEEP shape and contours as simple as proper performance of function admits.** This commonly helps to minimize tooling costs and may help to reduce the length and consequently the weight of stock needed. Each bend necessary in forming is likely to make necessary some extra machine work on the dies and the addition of extra bends may necessitate additional die parts. If, however, a single and somewhat complex piece can take the place of two parts requiring assembly, it may well prove more economical to use the more complex form.

* * *

3—**DO not specify the use of stock that does not have either circular or flat (ribbon) section unless the benefits derived are known to warrant a less common sectional shape.** Square, half-round, hex and other sectional shapes are obtainable in certain instances and their use is sometimes essential or highly desirable (as in making cotter pins from half-round stock, for example) but, in other cases, costs may be increased or long delays may be incurred if "special" shapes must be secured. In some cases, a flat, hex, square, or other unusual shape at some point or points on the wire form may be produced advantageously, say by a small coining or upsetting die placed in the press or on one slide of the machine. This, though probably increasing die and setup costs, permits of using conventional stock and may effect economics that more than offset other costs.

* * *

4—**SPECIFY materials of a standard shape, size, grade and finish (or to those readily available and suitable for the purpose) unless a departure therefrom is essential or yields some advantage that fully warrants the departure.** There are, of course, many cases in which materials regarded as "special" are fully justified by compensating benefits but, as such use often involves delays and sometimes introduces production problems, the designer should make sure that the advantage attained is not more than offset by any accompanying disadvantages.

* * *

5—**DESIGN the part so that all bends (or as many as attainment of satisfactory shapes permits) are in a single plane or nearly so, unless there is clearly a net advantage in making bends in two or more planes.** In general, parts having all bends in one plane are

simplest to form and involve lowest die cost, which are worthwhile advantages. Most of the parts in Fig. 1 have all bends in one plane. There are, however, numerous instances in which such advantages are outweighed by others attained when bends in two or more planes are made, even though dies may cost more to make and to set up. In such cases, of course, logic calls for choosing the better alternative.

* * *

6—**SEE that radii at bends are ample and that no radii are less than wire diameter or ribbon thickness unless it is certain that a sharper bend is feasible and can be made without danger of fracture or undue weakening of the metal at the bend.** Extremely sharp bends, though occasionally feasible, are rarely recommended and may require extra operations or an extra die or both. In such cases, the metal thins out at the bend and a notch effect with possible incipient failure under stress may result. In addition, if a sharp edge is needed on the die, this edge is likely to become blunted, hence die renewal charges are increased. Sharp outside corners at bends are rarely needed and can be produced only by swaging or some equivalent that is rarely warranted. Large radii at bends make for easier forming, greater strength and long die life, all of which are much to be desired.

* * *

7—**AVOID specifying bends closer to either end of the piece than twice wire diameter or ribbon thickness, unless the cost of extra operations and some waste of stock is warranted.** Bends close to ends are hard to make and may be practically impossible, especially if the wire is heavy or the stock thick. If such a bend is essential, it can be made by allowing an extra length of stock and shearing this off after forming, but this requires an extra operation or extra die parts or both and some stock is wasted.

* * *

8—**ALLOW liberal tolerances and never specify any that are closer than necessary or than can be held on mating parts.** Violations of this rule are likely to add to costs or to require extra operations or both and may result in excessive scrap loss. For reasons already explained, springback is hard to control and varies with variations in hardness. Since variation in springback also varies dimensions, tolerances wide enough to permit such variations are highly desirable and may be essential.

* * *

CORRECTIONS for variations caused by springback sometimes can be made but are likely to be expensive and to require extra tooling costs or delays for machine adjustment. If the extra costs exceed that of the piece, it is usually scrapped and waste may be high. As die wear, machine wear and other variables beside springback also affect dimensions of the wire form, there are good reasons for keeping tolerances as wide as will insure a satisfactory product. In no case should tolerances on thickness or diameter be closer than are obtainable at reasonable cost on the material specified.

* * *

9—**AIM to so design the wire form that it can be completed in the forming machine, unless requirements make this impossible or supplementary operations are fully warranted by benefits secured.** If the part can be completed in the forming machine, highest production rates and minimum labor charges usually result in minimum costs. But there are, on the other hand, many secondary operations (such as threading, for example) that the forming machine is not adapted to perform and that also add greatly to the utility of the product and are essential to performance of its function. In such cases, however, the designer should strive for a design that will make the secondary operations as few and as rapidly performed as will yield required results.

* * *

10—**WHERE an applied finish is required, is available in satisfactory form and thickness on pre-coated stock of suitable composition and temper and will not be injured unduly by necessary processing, specify the use of such stock.** By following this rule, the cost of finishing after forming can be saved and, as a rule, a "standard" pre-coated stock will cost only a little more than uncoated stock. The designer should make sure, however, that the formed part will meet requirements, as forming (and especially any necessary heat treatment after forming) may injure the coating already applied. In addition, no pre-coating will cover sheared ends or other surfaced cut by any tool used. A great variety of wire forms are produced in entirely satisfactory forms from pre-coated stock.

* * *

11—**AVOID designs that call for two or more deep bends on the same side of the form unless certain that the required shape is not impractical to produce.** Sinuous or wave-like shapes having deep convolutions make forming difficult or impractical because the wire or ribbon will be broken or unduly stretched unless it can slide around bends into die depressions as forming proceeds. If bends are sharp or depressions are deep, the wire is likely to lock and be broken. When there is a series of low convolutions and corners are well rounded, as on the wide ends of parts in center of Fig. 1, satisfactory forming is sometimes feasible.

* * *

THE foregoing applies to forming of the usual type on a length of wire cut off in each machine cycle just before forming starts. If the machine is set up for continuous forming, one or two convultions at a time, (as in making certain wire forms for book bindings, Fig. 5, for example) there is a series of duplicate operations during which the wire continues to feed from the reel. Then, any number of successive convolutions on one piece can be made. In such cases, however, the work is progressive and, as the wire is free to move for each successive bend, it is not broken by the die.

* * *

12—**LIMIT the number of cold forging and cutting operations, if any, to the minimum number and displacement of metal that will yield**

required shape. Such operations, though often yielding advantageous results, require extra die elements that may be subject to considerable wear. Any metal cut away constitues scrap and must be so deflected as not to jam in dies or interfere with their operation or with that of the machine. In forging operations, such as flattening, upsetting or notching, the greater the flow of metal required the greater is the power consumed and the heavier die parts must be. Loading on machine elements is also increased and if the loading becomes excessive, a slower and heavier machine may have to be used or the part may have to be shifted to a separate heavy press for supplementary operations. Such additional operations were required on parts D, I and J, Fig. 5. Each of these have large flats produced in coining dies in a heavy press. Near the ends of piece D two integrally formed projections are also upset at the same time that flattening is done. Piece I, later cut in two and assembled to form tongs J, has sets of flats in planes at right angles to each other. These are formed in two positions of coining dies shown in Fig. 6. Such expedients are often warranted but they should be avoided unless fully justified by advantages secured.

* * *

13—**AVOID closed loops or coils such as require movable pins or necessitate die elements that must be given a rotary motion unless results secured fully justify such extra costs as may be involved** Closed loops or coils often are needed and can be produced readily but they require extra die parts and, if the latter must have motion relative to the die body, means for actuation must be supplied. Such construction is often warranted and extends the utility of the wire forming machine but if simpler or less costly alternatives yield the results wanted, they are preferable.

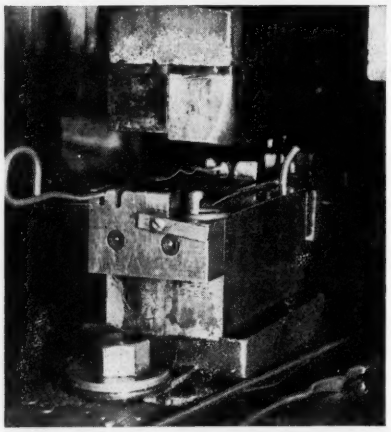

Fig. 6.—Coining Dies

* * *

14—**UNLESS the product is one of common shape and is known to be well adapted to efficient production as a wire form, see that the design is checked for possible production economics and that the shape chosen is such as to make the form one readily produced before the design is "frozen".** Such practice is recommended for any product designed for quantity production, because those constantly faced with similar production problems commonly know well which details of construction facilitate production and which tend to make it more difficult or more costly. Suggestions advanced by production experts need not always be adopted but, if they promise economies without sacrificing necessary advantages or will yield a better product at the same or lower cost — as is quite likely to be true —, such benefits ought not to be sacrificed.

* * *

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TABLE B

Table of Nominal Composition and Physical Properties of Materials Commonly Used for Springs and Other Tempered Wire Forms

Material	Nominal Composition Per Cent	Rockwell C-scale Hardness	Ultimate Tensile Strength psi*	Elastic Limit psi*	Modulus of Elasticity
Hard Draw Steel Spring Wire	Carbon, 0.50-0.75 Mn., 0.50-1.10	——	135,000-300,000	70,000-200,000	29,000,000
Music Wire	Carbon, 0.80-0.95 Mn., 0.30-0.60	——	220,000-400,000	120,000-280,000	30,000,000
Oil Tempered Steel Wire	Carbon, 0.60-0.95 Mn., 0.50-1.10	40-50	180,000-320,000	130,000-270,000	29,000,000
Annealed or Soft High Carbon Steel Wire (after tempering)	Carbon, 0.60-0.95 Mn., 0.50-1.10	40-50	180,000-320,000	130,000-270,000	29,000,000
Flat Spring Steel	Carbon, 0.60-0.85 Mn., 0.30-0.60	40-50	180,000-275,000	130,000-240,000	30,000,000
Stainless Steel	Carbon, 0.12 max. Chromium, 12-15	35-42	160,000-200,000	120,000-170,000	29,000,000
Stainless Steel	Carbon, 0.08-0.20 Chromium, 18-20 Nickel, 8-10	——	160,000-300,000	60,000-120,000	23,000,000 29,000,000
Cutlery Steel	Carbon, 0.30-0.40 Chromium, 12-15	40-52	180,000-240,000	130,000-210,000	29,000,000
Chrome-Vanadium (SAE 6150) (after tempering)	Carbon, 0.45-0.55 Mn., 0.50-0.80 Chrom. 0.80-1.10 Vanad., 0.15-0.18	40-46	180,000-215,000	170,000-195,000	30,000,000
Monel Metal	Nickel, 70 Copper, 30	100* Rockwell B	130,000-136,000	70,000-80,000	25,500,000
Phosphor Bronze	Copper, 92 Tin, 8	94-100	110,000-115,000	50,000-55,000	15,000,000
Brass	Copper, 70 Zinc, 30	88-90	90,000-95,000	32,000	14,500,000

* Coarse sizes test to the low side of range given, fine sizes to the high side of the range given. Data from "American Steel & Wire Manual of Spring Engineering."

The Fume Problem

PART II

Equipment for Controlling Fumes; a Scientific Approach to Fume Reduction and Elimination

By Wallace G. Imhoff, President,
The Wallace G. Imhoff Company
Los Angeles, California.

Part I was published in the April, 1948 issue of WIRE & WIRE PRODUCTS.

General Statement

ONE thing that becomes very quickly apparent in a practical study of the fume problem is that there are many different kinds of fumes, and before any progress whatsoever can be made it is necessary to understand and know how and why each fume is caused. Even knowing the many different kinds of fumes and what causes them is not enough to know how to definitely eliminate them, or even reduce or control them. The various kinds of fumes have already been described. A realization is at once apparent that each fume must be handled separately as an individual problem. A broad understanding of the problem shows that there are a few big underlying causes of fumes generally, and therefore before attacking the individual kinds of fumes, an explanation of some of the most important remedies will be given. The seriousness of the problem is indicated by the fact that actual cases are on record where the fumes become so bad in the winter time that the plant cannot be operated during certain weather conditions.

* * *

Weather Conditions Definitely Affect Fumes

ONE of the very first things we run into when studying fumes is that the weather vitally affects the amount of fumes formed. In the fall and winter and spring, especially during periods when rain is expected, when it is raw, cold, and damp, and when it is raining, or just cold with perhaps snow on the ground, the fumes may be very bad. On the other hand in the summer on a bright clear warm sunny day, usually a minimum of fumes are formed, and there are many days when the pickling and galvanizing departments are almost clear. So an intelligent approach to reduction and elimination of fumes is simply to try to duplicate the weather conditions when there are the least fumes. That requires taking the temperature and the humidity when the fumes are the least; and also again keeping a record when the fumes are the worst. Thus the very first broad attack on the fume problem is to duplicate the atmospheric conditions when there are the least fumes. That requires heating and ventilating engineering. But the problem of heating and ventilating a hot dip galvanizing plant is one of the most difficult pieces of engineering there is, and just how difficult it is may be seen from just one example where a very large engineering firm accepted the task of properly ventilating a galvanizing plant on the basis that if they succeeded in eliminating the fumes they got paid; if they failed, then the costs of trying were to be borne by them. They finally gave up the job after a year their ability to stop the fumes ending in a complete failure.

* * *

Very Large Pickle Capacity Most Important Factor

CONTROLLING the weather (atmosphere) in a galvanizing plant is a very important step in fume reduction and control, but an even more important remedy is a very large pickle capacity. That means very large individual pickling tanks, and a large number of tanks. This most vital point in eliminating fumes has been the least understood, and in many plants already built it is impossible to increase the pickle capacity when that factor is known and appreciated, simply because there is not room to add additional tanks. To understand why a very large pickle capacity is so important in fume control, it is necessary to contrast the operating conditions with only a few pickle tanks and very small pickle capacity. The elements of control are acid strength, and bath temperature. These determine the pickling time, along with the kind of steel base, method of fabrication of the article, and the kind of scale or iron oxide to be removed. In summer time the ordinary pickling solution will start to fume at about 140 to 160 degrees F. depending upon the weather conditions. Above 160 degrees F. most all pickling solutions will fume, especially in the fall, winter, and spring when the weather conditions favor the development of fumes. The time element of pickling is a vital one from the standpoint of getting out the desired production. When there is too small a pickle capacity then the acid strength must be high, and the pickle operated at a high temperature. This combination gives the pickling time required to produce the desired production. But the fumes may be absolutely abominable, and working conditions such that the men are very much irritated by the fumes, are uncomfortable, and as actually seen in one plant actually tormented by the biting acid vapors on their faces. If the solution of the fume

problem is one of meeting production, then if one small tank is a heavy fume producer with work being pickled in 15 minutes, at an acid strength of 10 to 12%, and a bath temperature of 180 degrees F., then two tanks of the same size with a pickling time of 30 minutes will give the same production. The advantage is that the bath temperature can now be lowered below the fuming stage, that is 160 degrees F., and the acid strength can be dropped from 12% to 6 or 8%. The idea illustrated is that more tanks, and a larger pickle capacity, will give the same production in a longer time, at a lower temperature, and a weaker acid strength. The larger pickle capacity, when combined with other scientific control factors such as the use of a good inhibitor and foam blanket, will eliminate practically all of the obnoxious fumes formed with a small pickle capacity, high acid strength, short pickling time, and a bath temperature that tends to break down and destroy the value of many inhibitors and fume blankets. This then is the second very vital factor in fume elimination—namely, to install a very large pickle capacity.

* * *

Use of Inhibitors and Foam Blankets Very Important

THE development of modern inhibitors and foam blanket materials has greatly improved the fume conditions in pickling. It is not only a question of improving fume conditions, but it pays well from a cost standpoint to use them because of the saving in acid used, the saving in metal lost, the better quality of pickling, and dozens of other improved factors of pickling, all of which save money. No galvanizing plant today should operate without using a good commercial inhibitor and foam or fume blanket. The inhibitor takes up the hydrogen formed by the chemical reactions of pickling on the base metal, and the foam blanket covers and holds in the acid spray, steam vapors, and all obnoxious fumes and vapors that come from pickling tanks that do not use these materials. So here is another very important and vital piece of equipment and method of reducing, controlling, and eliminating fumes — use a good commercial inhibitor and a good fume blanket.

* * *

Proper Heating and Ventilation

THIS subject is so well commented on by an editorial appearing in **"Metal Cleaning and Finishing"**, October 1929, Vol. 1, No. 6, that we believe it is worth while quoting it —

> **"Ventilation of Metal Finishing Shops"**
>
> **"Real progress has been made in the finishing field in recent years. Scientific control and research has practically revolutionized operating methods.**
>
> **However, research has even gone further than the investigation of the actual processes used and has extended into the subject of plant conditions. That is, it has actually determined that a well lighted and properly ventilated plant has a beneficial effect on the health of the employee and that it attracts a better class of worker and reduces labor turnover, which in turn is reflected on the production charts.**
>
> **Practically every large modern plant is confronted with the problem of shop ventilation. It is an established fact that bad air is an insidious destroyer of health. Stale, poisonous air is a menace and results in drowsiness, inefficiency and easy susceptibility to disease. Fortunately, there are means of remedying these conditions. Electric exhaust fans capable of completely changing the air of large rooms every two or three minutes are available.**
>
> **To the manufacturer utilizing pickling solutions, hoods and canopies are available, while for spray operations, booths serve to prevent contamination of the surrounding atmosphere.**
>
> **THE PROGRESSIVE PLANT EXECUTIVE REALIZES THAT A HEALTHY EMPLOYEE WORKING IN A WELL VENTILATED ROOM IS CAPABLE OF PRODUCING FAR MORE THAN A SICKLY SLUGGISH WORKER. Thus the question resolves itself into one of economy and since the cutting of production costs is a prime factor in present day manufacturing policy, it might be well to investigate thoroughly this subject of ventilation."**

* * *

HOWEVER, solving the fume problem is not just one of installing fans and hoods; thousands of dollars have been spent on many different kinds of ventilating equipment without producing the desired results of fume removal or fume control. The reason for the failure is to be found in the fact that it is of the utmost importance to success to know how to use and install ventilating equipment, hoods, and fans.

Engineering Principles Involved in Controlling Fumes

IT is a strange thing the way the same problem is handled in two different locations. For example, no home owner could be convinced that there could be a break, or an opening from his coal furnace in his cellar and his chimney. He knows and understands full well and very clearly, that it must be a closed system or the smoke and fumes from combustion of the fuel will scatter and spread through the cellar air and that such air cannot be breathed. Yet this same manager who clearly understands his home furnace problem will go out to his plant and become bewildered with his smoke and fume problems from pickling and galvanizing operations. There is not a particle of difference in the engineering involved; the difference and trouble arises from the fact that there are no production operations being carried on around his furnace in his cellar. His real problem therefore becomes one of maintaining exactly the same engineering conditions in his plant that he has in the home furnace in his cellar (that is a closed system), while at the same time exercising every bit of his ingenuity to set up conditions that will permit the fumes to be carried off properly while at the same time his production goes on through his pickling tank and galvanizing furnace.

* * *

A Closed System Must Be Established

IT is obvious that the simplest system of controlling pickling fumes is to have a pickling tank with a cover over it; a closed system. PLATE 1 illustrates the correct method of controlling pickling fumes. From then on it becomes a very highly skilled problem of engineering to set up exactly that same condition under all types of pickling, with all kinds of articles, and whether the operations are continuous or intermittent. This is the test of real engineering ability; to be able to set up a closed system under any and all conditions of pickling. PLATE 2 shows this high-

Plate 1. — Two lines of pickling tanks which have Triflex-lined steel covers. The fumes are handled as shown in Plate 2. * * * (Courtesy of the B. F. Goodrich Co., Akron, Ohio)

* * *

ly developed engineering skill in drawing the pickling fumes over to the acid fume scrubber where they are intermingled with a spray of water. The exhauster carries the washed vapors to the main sewer, while the washed fume waters are carried out in a rubber-lined sewer shown in PLATE 3. PLATE 4 is a 2-foot Triflex-lined stack that carries off the pickling fumes in another plant. This is the correct method of handling pickling fumes, but the engineering involved in this illustration is often very hard to duplicate in smaller plants, and on intermittent production of various kinds of articles, instead of continuous pickling on one kind of article. The value of the illustration is in the fact that it gives a goal to be attained for other much more difficult pickling operations.

* * *

Broken Systems Ineffective

THIS emphasizes one extremely important fact, namely, that any broken system of control is ineffective, costly, and does not accomplish results of much value. It points the way clearly that to be effective, and **REALLY CONTROL FUMES THE SYSTEM MUST BE A CLOSED SYSTEM.** Since in any open system all the air in the room becomes polluted and obnoxious, no system of roof ventilators, fans, etc. can properly solve the fume problem, because the fumes are loose at their source and allowed to contaminate the air of the entire room. This again goes back to the simple illustration of the coal furnace in the cellar. Who would think of, or permit a furnace to operate in the cellar without a flue pipe even if there were fans in the floor or side walls of the house to carry off the smoke and fumes. Anyone would know better than that, yet moving the same problem to an industrial plant, many companies want to do just that. They would fully comprehend that they could not go into their cellar with a furnace with no flue pipes, yet they expect men to work in the same conditions with fumes pouring from pickling tanks and the galvanizing furnace, with the fans up in the roof, leaving the atmosphere below contaminated by spreading obnoxious fumes all over the room. The only thing that happens is that fumes are diluted before they are removed, and the air all over the room is contaminated by a diluter state of the fumes. The same engineering principles hold good for loose galvanizing fumes that are applied to loose pickling fumes.

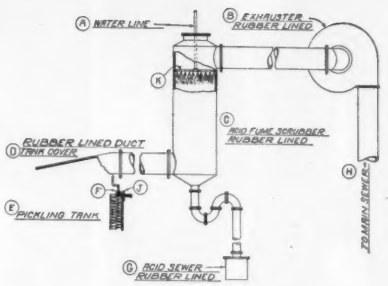

Plate 2. — Acid Fume scrubber, and method of removing acid from gases. * * * (Courtesy of the B. F. Goodrich Co., Akron, Ohio)

* * *

Fumes May Be Enclosed in Down-Draft System

H. R. Phelps, Assistant Chief Engineer, American Blower Corporation, Detroit, Michigan, in his article **"Exhaust Systems for Pickling Tanks"**, clearly illustrates how pickling fumes may be handled in a closed system of down-draft removal of the fumes. The duct system is built between the double pickling tanks, and on both sides of single pickling tanks. Thin slots are provided so that the fumes are sucked into the system from the surface of the pickling baths as fast as they develop. The velocity of removal is 2000 feet per minute, and the total volume exhaustion is 250 cubic feet per minute per square foot of liquid surface. The details of this enclosed down-draft removal system are described in detail in **"Better Enameling"** March 1940.

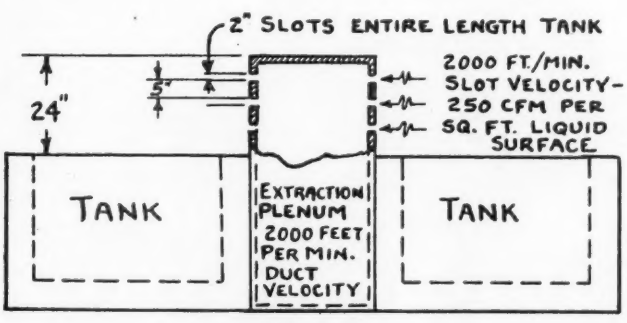

FIG. 1

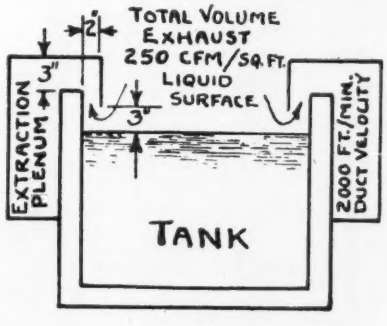

FIG. 2

ACROPAK

ACROPAK has no crevices, no weak points, gives more strength with less weight. ACROPAK can be reversed on spindle without re-setting the traverse. ACROPAK is adaptable to end take-off.

ACROPAK assures a minimum of wire breakage through uniform flow of wire on and off spool. Because ACROPAK cannot rust, it does not have to be reconditioned by cleaning and buffing after each use.

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SIZES AVAILABLE
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Flange Diam.	6"	4½"
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Diagram of Correct Method of Handling Fumes

BOTH of the above methods just described, the ENCLOSED overhead hood method, and the down-draft dust system are illustrated in Figures A1 and A2. The top diagram shows the wrong method with the fumes spreading all over the room and contaminating the entire air in the room. The bottom figure shows the clear atmosphere in the room when the fumes are CONFINED and not allowed to become dispersed all over the room. Also both the overhead hood method and the down-draft duct systems, BOTH OF WHICH ARE ENTIRELY ENCLOSED, are illustrated. Figure 1 illustrates the correct method of handling and the pickle room fumes, while Figure 2 illustrates the correct method of controlling the galvanizing pot fumes. These are THE ONLY WAYS THAT FUMES CAN BE DEFINITELY CONTROLLED. It will be noted that when buildings are built with ventilators of various kinds inserted in the roof that the FUMES ARE NOT EFFICIENTLY HANDLED. First they are allowed to disperse and contaminate ALL THE AIR IN THE ROOM, and then it becomes a question of only HOW MUCH CONTAMINATION CAN THE WORKERS STAND. What is done by this method is to ESTABLISH A DILUTED CONTAMINATED ATMOSPHERE WHICH THE WORKERS CAN ENDURE, but in many instances the fumes are still so heavy that the workers are affected materially with resulting colds, and other sickness, AS A DIRECT RESULT OF BREATHING THE HEAVILY CONTAMINATED AIR ALL DAY LONG.

* * *

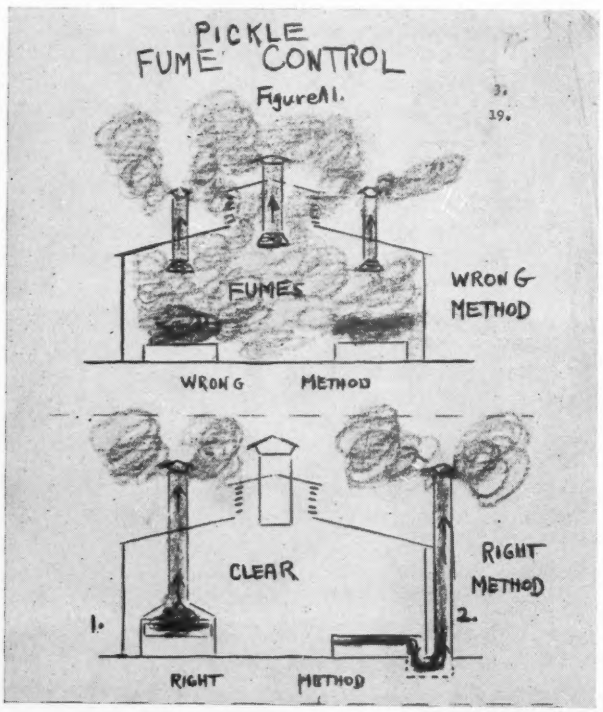
Methods of Controlling Galvanizing Pot Fumes

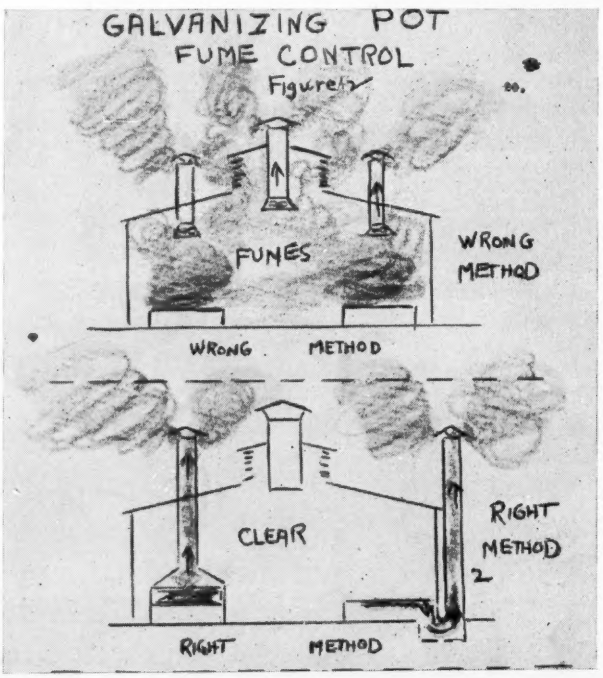
THE furnace in the cellar is easy to handle because the enclosed system is always kept closed. In industry the BIG PROBLEM IN ENGINEERING IS HOW TO KEEP THE SYSTEM ENCLOSED and STILL PERMIT PRODUCTION TO BE HANDLED. The broken-system of using overhead hoods over the galvanizing pot is illustrated in PLATE 5. This system is just as effective as a furnace in the cellar set up in the same way would be. If one of the cellar windows happened to be open giving a cross draft not much smoke would go up the hood. In most industrial plants there are always cross drafts due to open doors and windows. PLATE 6 illustrates another method of handling the galvanizing pot fumes. Here we have a draft system to drag or suck the fumes from the surface of the galvanizing bath. There is a large 30-inch pipe with a large fan up in it that furnishes the suction to draw the fumes off the surface of the bath. Attention is also called to the square chimney from the combustion chambers that throws the waste heat and gases also into the ducts behind the slit openings. This rising heat helps to furnish the suction to drag off the fumes. This type of fume control is very effective when the equipment is designed correctly. It permits of the use of an overhead monorail for handling production.

* * *

Diverting Combustion Gases Into Hoods

IN a number of hot dip galvanizing plants the byproducts of combustion are diverted up into the





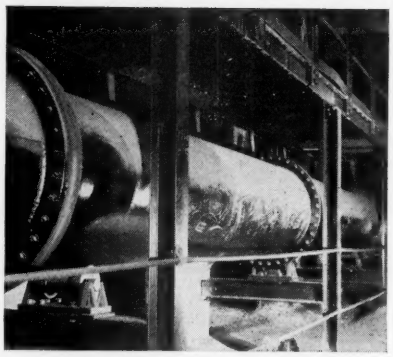


Plate 3. — Combination fume and sewer line which handles the fumes and spent liquor from a continuous pickling line. ★ ★ ★
(Courtesy of the B. F. Goodrich Co., Akron, Ohio)

hood over the galvanizing bath to permit the heat from the waste gases to carry the pot fumes up out into the open air. That method eliminates the fumes from the galvanizing department, but under modern city smog regulations such a method may not be satisfactory from the city smoke law standpoint.

★ ★ ★

Reduction and Elimination by Change of Technique

THE worst pot fumes come from the fluxing reactions. It is extremely important therefore to know that the old muriatic acid dip with the use of sal-ammoniac for the flux salt creates far more fumes than the new liquid flux technique using zinc ammonium chloride. The reason for this fact is to be found in the chemical reactions. When sal-ammoniac salt is used far more ammonia fumes, ammonium chloride fumes, and muriatic acid fumes are formed than when the double salt is used. This is because there is actually less ammonium chloride, and more zinc chloride. The ammonium chloride is the activating fume producing element so that when this component is actually less, there naturally are less fumes produced in the fluxing reaction. Since the zinc chloride is the vehicle which holds the operation largely in the flux box, the more liquid zinc chloride there is present in the salt, the less the amount by the chemical reactions of fluxing, and therefore the less fumes actually produced. So one of the very best methods of reducing fumes is to eliminate a large part of them entirely by using the liquid flux technique to replace the old technique of the muriatic acid dip and the use of the greater fume producing salt, sal-ammoniac, or ammonium chloride salt alone instead of the double salt, zinc ammonium chloride. This new technique also eliminates the muriatic acid entirely which therefore eliminates all fumes from the muriatic acid dip.

Plate 5. — Broken-System of using an overhead hood over the galvanizing pot. ★ ★

★ ★ ★

Reduction of Individual Fumes Necessary

THE fume problem has been previously discussed and shown to be extremely complicated because it involves so many different kinds of fumes. The first classification is into fumes from pickling operations; the second classification is fumes from galvanizing operations. The next step is the actual identification of the fume, and what operations and chemical reactions develop it. As previously stated the real test of engineering ability comes in being able to design a CLOSED SYSTEM, or hood, piping, fans, etc., that WILL CONFINE THE FUMES and yet at the same time PERMIT THE NORMAL OPERATIONS OF PRODUCTION TO BE CARRIED ON. One large steel company built a completely enclosed wooden hood, with a wooden stack around each pickling tank, and had hinged lift doors on both front and back of the hood so that the pickled work could be taken out, and the black work laid on a lift crate that was raised and lowered into the pickling tank entirely enclosed in the hood.

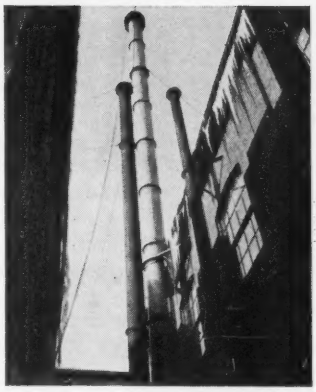


Plate 4. — A 2-foot Triflex-lined stack that carries off the fumes from a pickling room.
(Courtesy of the B. F. Goodrich Co., Akron, Ohio)

★ ★ ★

That method was efficient, but the hoods around each pickling tank cost considerable money as an investment when all the hoods were added together. There is still the modern problem of fumes sent out of the pickling department into the city atmosphere. Modern city fog, smog, fume, and smoke regulations have placed a double responsibility for fume elimination. They must be not only eliminated from the pickling department, but must be so eliminated that they are not thrown out over the neighborhood and city as fume and smog. The only method that will conform to this law is that of turning the fumes into the washer, and then diverting both the waste liquor and the fumes into the rubber-lined sewer. Even

(*Please turn to page* 435)

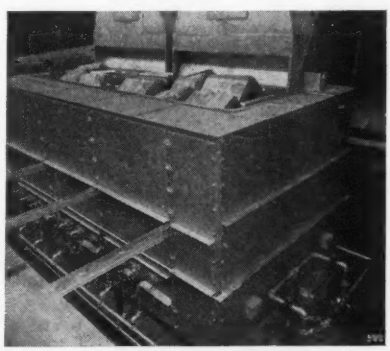


Plate 6. — Handling galvanizing pot fumes by creating a heat-suction draft to draw them off the bath surface into the enclosed system of removal. ★ ★ ★ ★ ★ ★
(Courtesy of the Electrical Manufacturing Co., Battle Creek, Michigan and
The Eclipse Fuel Engineering Co., Rockford, Illinois).

Wire Association Elects Officers for 1948

THE Annual Meeting of the Board of Directors of the Wire Association was held at the Waldorf-Astoria hotel in New York on Friday, April 16th, 1948.

* * *

AT this meeting the officers elected for the 1948 term were **LeRoy D. Seymour,** Manufacturing Manager, Wire Division, John A. Roebling's Sons Company, Trenton, N. J., President; **Fred M. Crapo,** President, Indiana Steel & Wire Company, Muncie, Indiana, Vice-President; **H. B. Carnahan,** Works Manager, Canada Wire & Cable Co., Ltd., Leaside, Ont., Canada, Vice-President Non-Ferrous Div.; **R. E. Brown,** Publisher, Wire & Wire Products, Stamford, Conn., Secretary and Treasurer.

* * *

Mordica Memorial Lecture for 1949

IT was announced that the Mordica Memorial Lecture for 1949 would be given by **Clem L. McGowan,** Supt. of Wire Mills, Atlantic Steel Company, Atlanta, Ga. Mr. McGowan will review the early history of the wire industry, and it is expected that some very interesting information regarding the early developments of the industry will be furnished in this lecture.

* * *

Medal Award for 1947

AFTER consideration of all the papers submitted during 1947 the directors decided that no Medal award would be made for the papers presented during that year.

* * *

IT was thought that while many of the papers were interesting and possessed real merit, none of those submitted met the standards required for the Medal Award.

1948 Convention Program Matters

THE 1948 Program Committee chairman, **L. C. Crewe,** President, Maryland Fine and Specialty Wire Co., Inc., of Cockeysville, Md., advised that the committee had 12 papers for the Ferrous Division and 4 for the Non-Ferrous Division; one plant inspection arranged for through the courtesy of the Westinghouse Electric Corporation for their East Pittsburgh Plant and one steel plant inspection tentatively arranged for.

* * *

THE committee reported that in accordance with the resolution passed at the Directors' Meeting in 1947 the Convention would require 5 full days for its completion.

* * *

AT the request of some of the Canadian directors and members, it has been decided to hold an annual Canadian Regional Meeting in the Spring of 1949 at either Montreal or Quebec and **Allan B. Dove,** Supt. Dominion Works of the Steel Company of Canada, Ltd. Lachine, Que., Canada, was appointed chairman of the committee. Other members of the committee appointed by the president were; **H. B. Carnahan,** Works Manager, Canada Wire & Cable Company, Ltd., Leaside, Ont., Canada; **Wm. H. Eastlake,** Asst. Gen. Supt., Northern Electric Co., Ltd., 1261 Shearer St., Montreal, P. Q., Canada and **A. Lauder,** Works Manager, Phillips Electrical Works, Ltd., Brockville, Ont., Canada.

* * *

San Francisco Regional Meeting

IN connection with the San Francisco Regional Meeting to be held at the Sir Francis Drake Hotel on June 4th, 1948, the committee reports that it has mapped out and submitted the following program.

9-10 A.M.—Registration.
10:30 A.M.—Plant Inspection Trip to Wire Mill of Columbia Steel Co., Pittsburg, Calif.
7:00 P.M.—Dinner — Sir Francis Drake Hotel.
— Guest Speaker
Kenneth Smith, President
California Redwood Association
8:30 P.M.—Technical Meeting.
Paper: The Use of Wire Coating Compounds.
Paper: Powder Metallurgy.
Motion Picture: "Watts in Glass".

* * *

IT is requested in this connection that all reservations be sent to Earl R. Potter, Industrial Wire Products, Corp. 2039 Sacramento Street, Los Angeles 21, California. Registration includes dinner and the price has been set at $5.00.

* * *

Annual Smoker Dinner

IN connection with the Annual Convention of the Wire Association the Annual Smoker Dinner will be held at the William Penn hotel in Pittsburgh, Pa., on Wednesday, October 20th, 1948. Since this dinner is now an Association matter all the arrangements in connection with it will be handled through the office of the Executive Secretary of the Association.

* * *

FOLLOWING the Directors meeting at which these decisions were made the directors held their annual luncheon with 45 people present.

* * *

THE program consisted of an address by **Dr. Allen Stockdale,** Dean of speakers of the National Association of Manufacturers who spoke on the subject of "Plans for Management to Educate Workers as to Policies, Profit and Operations

(*Please turn to page* 435)

GOVERNMENT WIRE PRODUCTION INFORMATION

Chromated Protein Films Inhibit Corrosion

CHROMATED protein coatings offering a convenient, inexpensive means of protecting metals —especially zinc, iron, brass, and aluminum— during outdoor storage in mildly corrosive atmospheres have been developed by Abner Brenner, Grace Riddell, and Robert Seegmiller of the National Bureau of Standards. The protective value of such films is somewhat better than that afforded by chemical surface treatments and is much superior to that of corrosion-inhibited oils and waxes. The metallic surface to be coated is first dipped in casein, albumin, or gelatin; the resultant film is then impregnated with chromate, which both hardens the film and inhibits corrosion.

* * *

THE wartime scarcity of many nonferrous metals led to the extensive substitution of ordinary carbon steel for copper, brass, aluminum, and stainless steel in both military and civilian uses. While the steel was generally protected with zinc coatings, the tendency of the zinc to form objectionable corrosion products brought about a widespread use of chromate films on the zinc. These films were formed on the surface by chemical attack in aqueous chromate solutions and, though only a few hundred-thousandths of an inch thick, were useful in inhibiting corrosion. However, as this was apparently due to the presence of minute amounts of soluble chromate, slowly liberated by the action of moisture, it seemed possible that an enhanced corrosion resistance might be obtained by applying a large quantity of chromate to the metal surface. The National Bureau of Standards therefore undertook an investigation in which proteins were found to offer a good medium for increasing the amount of chromate on the metal surface since they are basic and readily absorb or combine with chromic acid. Although initially developed at the Bureau as a substitute for chemical surface treatments of zinc, the chromated proteins are also of value in protecting aluminum, steel, brass, and other metals.

* * *

THE principal constituents of the chromated protein films are a corrosion inhibitor for the metal, a protein which acts as a vehicle for the inhibitor, a hardening agent, and a bactericide to prevent putrefaction of the protein. The chromate always serves as the inhibitor and may act as the hardening agent and the bactericide as well. However, other materials such as formaldehyde, tannins, or certain salts of the heavy metals can be used as the hardening agent.

* * *

THE four functioning constituents of the film can be applied in a single step or in several steps, according to the compatibility of the

MICROMETER PRECISION

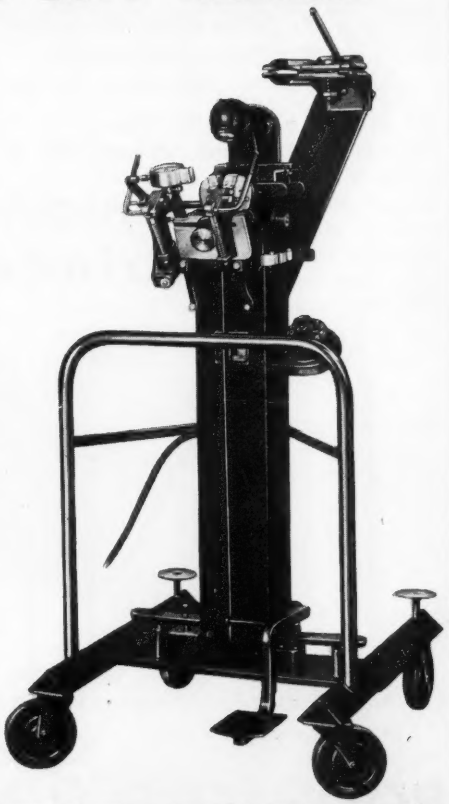
MICRO-WELD

TRADE MARK REG. U. S. PAT. OFF.

MODELS J-3-S and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to .160" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation on high carbon wire.

Standard equipment with these units include annealing dies, filing vise, light, extension cord, and mounted on a 4-wheel truck. Special units can be furnished for crane mounting.

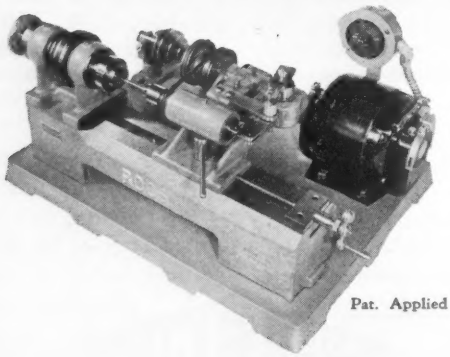


MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.

Telephone, State 7468

NEW DIE FINISHING MACHINES
For the Die Room



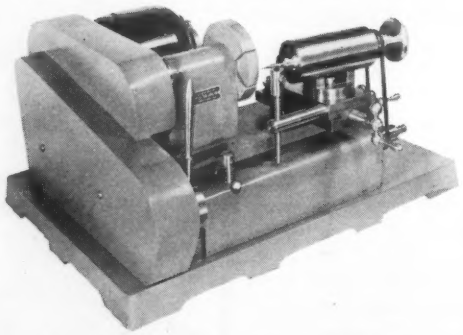
Pat. Applied For

Roos "DYKREX" Fully Automatic Polisher

"It Corrects the Die"

- Saves labor, saves time
- Steps up Production
  More dies per day.
- Saves Money
- Fully Automatic with timeswitch

Roos Precision Pin Grinder



A machine that any Die Room employee can operate and make the finest lapping pins in less time and at less cost than a skilled mechanic.

ROOS TOOL & MFG. COMPANY
17-19 GROVE STREET
Montclair, New Jersey

agents and the degree of protection desired. In the "two-step" process, which is usually the most satisfactory, the metal is first dipped into an aqueous protein solution. When the resulting protein film is dry, it is immersed in an acidified chromate solution for one-half to three minutes and allowed to dry without rinsing. The preparation of the protein solution varies somewhat with each protein. Gelatin is dissolved in water by heating gently; albumin may be dissolved in water at room temperature by stirring; casein is dispersed in water and brought into solution with the addition of 25 ml of ammonium hydroxide per liter of solution. The chromate solution contains chromic acid (0.5 to 2 per cent) or a dichromate of zinc, iron, or nickel (1 to 10 per cent).

* * *

A simpler "one-step" method of forming the inhibiting film by a single immersion in a solution containing both the protein and the chromate has the disadvantage that the solution slowly deteriorates. A solution of this type is made by adding ammoniacal zinc chromate to a solution of casein. The resulting preparation should contain about 10 per cent of casein and the equivalent of about 5 per cent of zinc chromate.

* * *

THE chromated protein films are yellow and, unless opaque pigments have been added, are transparent. Their flexibility and adhesion are sufficient to prevent cracking or separation when the metal is bent. They are not injured by heating to 150° C, whereas most chromate films produced chemically on zinc lose much of their protective value at 100° C. Thickness depends principally on the concentration and viscosity of the protein solutions, varying with the type of protein up to about 0.0002 inch. This is in contrast to the proprietary chromate films, which usually are not more than 0.00003 inch thick.

* * *

WHEN freshly prepared and hardened, the films are almost insoluble in water and are so hard that they cannot be scratched with the finger nail. Exposure

to light further hardens some films and renders them still less soluble. However, the films may be quickly removed from metal parts by application of an alkaline solution such as 5 per cent sodium hydroxide. Their removal is thus more convenient and less hazardous than the removal of oil films with toxic or inflammable organic solvents.

* * *

THE protein solutions, unlike the baths used for direct phosphate or chromate treatments, do not become exhausted and require replenishment, but are fairly stable for long periods. While chromated protein films are superior to direct phosphate or chromate coatings or to oil films for corrosion prevention, their life is less than that of suitable paint coatings. They are more effective on large, regular surfaces than on the sharp edges and corners of small objects like nuts and bolts, where the film tends to pull away.

[1]**For further technical details see "Chromated protein films for the protection of metals", by Abner Brenner, Grace Riddell, and Robert Seegmiller, in J. Electrochen. Soc. for March 1948.**

* * *

Electrical Symbol Dictionary

A dictionary of German electrical symbols originally published for United States military use is now available from the Office of Technical Services, Department of Commerce.

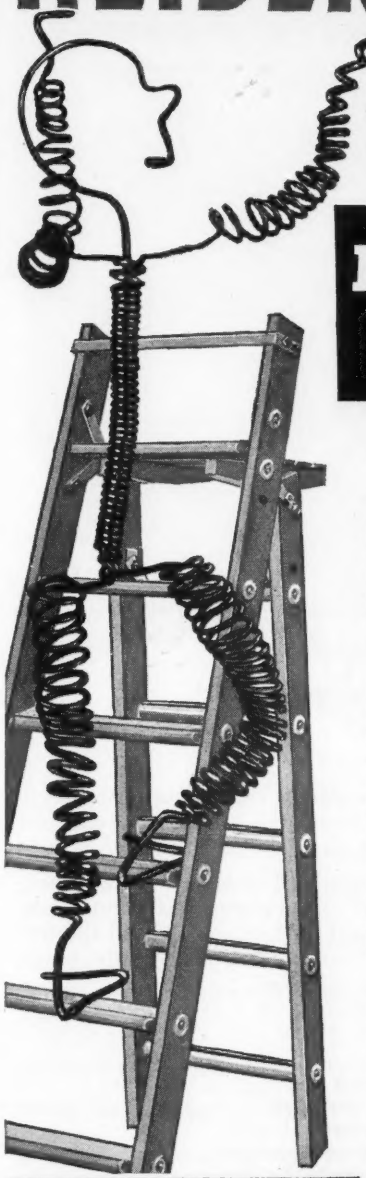
* * *

THE dictionary was prepared by the Chief Signal Officer of the United States Forces in Europe and comprises approximately 1,200 symbols used to designate components of German communications systems. Each symbol is identified according to conventional American designation. In addition, samples of various types of communications set-ups and line route networks are presented.

* * *

THE dictionary contains symbols representing switches, relays, selectors, acoustic transmission apparatus, tubes, and equipment peculiar to telephony, telegraphy, radio, television and radar.

HEIDER* Ladder Rungs are reinforced with KEYSTONE WIRE

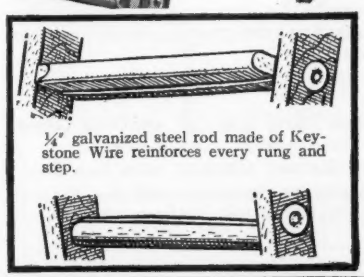


The 2-Way Step and Straight Ladder, is one outstanding example of Heider ladder construction. Every step and rung is reinforced with a ¼" galvanized steel rod made from Keystone Wire . . . greatly increasing the strength under load and giving a wide margin of safety.

An important reason why the Heider people achieve and maintain leadership in their field is the extra care with which they select materials.

Keystone cold-heading wire is the choice of this manufacturer because of its cold upsetting and threading qualities. Controlled manufacturing practices . . . plus rigid mill tests and inspections . . . give Keystone Wire the internal soundness, uniformity of chemical composition and freedom from injurious surface defects necessary for precision manufacturing techniques.

We are indeed proud that Keystone Cold-heading Wire is a recognized factor in the structural soundness of Heider ladders.



¼" galvanized steel rod made of Keystone Wire reinforces every rung and step.

* *Heider Manufacturing Co. Carroll, Iowa*

KEYSTONE MUSIC SPRING WIRE

SPECIAL ANALYSIS WIRE for all industrial purposes

KEYSTONE STEEL & WIRE COMPANY
PEORIA 7, ILLINOIS

At the heart of Spencer

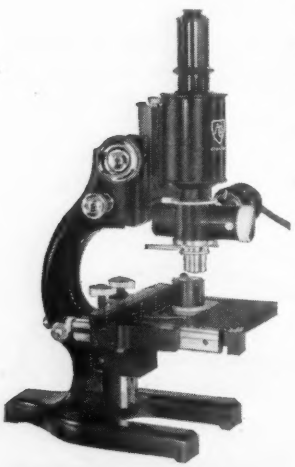
METALLURGICAL MICROSCOPES

—A HIGHLY EFFICIENT VERTICAL ILLUMINATOR

AN ILLUMINATOR that is simple to operate, that is sturdy enough to take hard usage . . . that provides increased brilliance and contrast—minus glare . . . that is always cool enough to handle.

Pioneered by American Optical Company, the Spencer Vertical Illuminator has a first surface mirror, and coated plano-glass reflector, conveniently interchangeable. Additional features are field and aperture diaphragms, built-in light intensity control, and interchangeable filters.

SPENCER METALLURGICAL MICROSCOPES offer many other outstanding advantages:



- **QUICK-CHANGE NOSEPIECE** facilitates interchange of objectives
- **COATED OPTICS** eliminate reflections and provide added contrast
- **WIDE RANGE STAGE** adjusts to unusually large or small specimens
- **LARGE RESEARCH-TYPE STAND** has interchangeable body tubes
- **FINE ADJUSTMENT** is precise, enduring micrometer screw type
- **POLARIZING FILTER AND CAP ANALYZER** (accessories; enable the use of polarized light
- **GROOVED BEARING SURFACES** assure long wear
- **ELEVEN STANDARD COMBINATIONS** offer choice of stages, optics, illuminators, and body tubes

For further information write Dept. E160.

American Optical
COMPANY
Scientific Instrument Division
Buffalo 15, New York

Manufacturers of the **SPENCER** *Scientific Instruments*

PRINTED copies of the 120-page dictionary, now issued as an OTS report (PB-85121; **Dictionary of German electrical symbols)** are available at $3. Orders for the report should be addressed to the Office of Technical Services, Department of Commerce, Washington 25, D. C., and should be accompanied by check or money order payable to the Treasurer of the United States.

* * *

Institute of Metals Medal, 1948

THE Institute of Metals (Platinum) Medal for 1948 has been awarded to **Robert Crooks Stanley,** Chairman and President of the **International Nickel Company of Canada, Ltd.,** in recognition of his outstanding services to the non-ferrous metal industries.

* * *

MR. Stanley has been with the Company and its predecessors since 1901. He has provided the leadership during the Nickel Company's most intensive growth which has contributed largely to its emergence as one of the world's leading and most successful mining and metallurgical enterprises.

* * *

ON the organization of the original International Nickel Company in 1902, Mr. Stanley became Assistant Superintendent of the Camden (N.J.) Works, and subsequently Superintendent. His energy and ingenuity in changing the Camden plant from an Old World chemical manufacturing works of detached units into an integrated undertaking applying up-to-date metallurgical methods as Assistant General Superintendent of the Orford Copper Company, where again he was responsible for a complete modernization program.

* * *

"MONEL", the white alloy of nickel and copper, owes its discovery in 1905 to Mr. Stanley, who conceived and developed the process for producing the alloy direct from ore without separating the nickel and copper. In 1917 he was elected a Director, and in 1918

Vice-President in charge of all operations of the International Nickel Company. He became president in 1922.

* * *

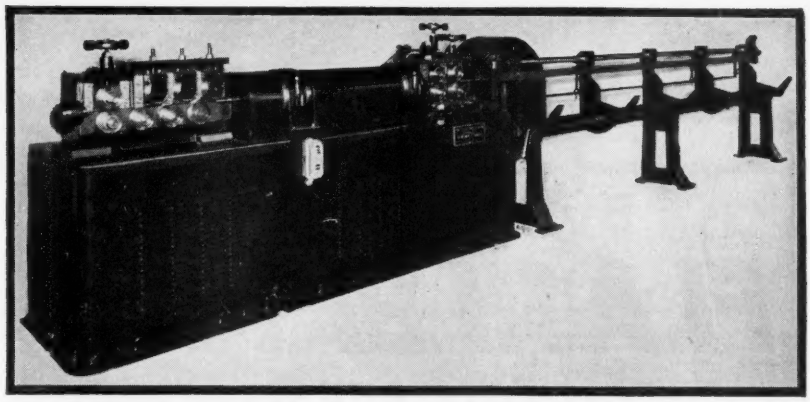
AGAIN in World War II, Mr. Stanley was responsible for greatly increasing nickel production for its many vital war uses. Soon after the war started, he arranged for extensive expansion of the Company's Canadian mining production, through which a materially increased supply of nickel, copper, and other products was made available to the United Nations in the crucial war years.

* * *

MR. Stanley's achievements in the nickel industry have brought to him the award of the Thomas Engleston medal presented by Columbia Engineering Schools Alumni Association, the award of the first gold medal of the Rand Foundation by the American Institute of Mining and Metallurgical Engineers, and the American Society for Metals' medal for the Advancement of Research, while in 1937 the King of Belgium conferred upon him the Order of Leopold. In September 1947 Mr. Stanley was awarded the "King's Medal for Service in the Cause of Freedom". This medal was instituted by King George in 1945 "for Civilian Services to the Allied Cause". He has also been awarded the degrees of Sc.D. of Columbia University and the D.Eng. degree of the Stevens Institute of Technology and of the Rensselaer Polytechnic Institute.

* * *

IN addition to his responsibilities with the International Nickel Company, Mr. Stanley is a Director of the Chase National Bank of the City of New York, the American Metal Company, Ltd., the United States Steel Corporation, the General Electric Company, the Amalgamated Metal Corporation, Ltd., (London), the Babcock and Wilcox Company, the Canadian Pacific Railway Company, the Economic Club of New York, and Henry Gardner and Company, Ltd. (London). He is also Chairman of the Board of Trustees of the Stevens Institute



Type 3A — Cap. 3/16" — 3/8" Dia. (7/16" Dia. in Soft Stock)
Type 4A — Cap. 3/8" — 5/8" Dia. (11/16" Dia. in Soft Stock)

•

STRAIGHTENER SPECIALISTS FOR OVER 80 YEARS

Some of the refinements developed in that time—

Almost continuous wire travel

Lightening cut-off that assures square ends

High-speed, direct-driven 5-die straightening flier

Quiet, efficient V-belt drive

Ball & roller bearings thruout

Extreme rigidity

Types for capacities from 1/32" to 11/16" diameter

[DESCRIPTIVE FOLDER SENT ON REQUEST]

THE F. B. SHUSTER MFG. COMPANY, INC.
3102 MILL RIVER STREET, NEW HAVEN, CONN.

SHUSTER SINCE 1866
Automatic WIRE STRAIGHTENING AND CUTTING MACHINES

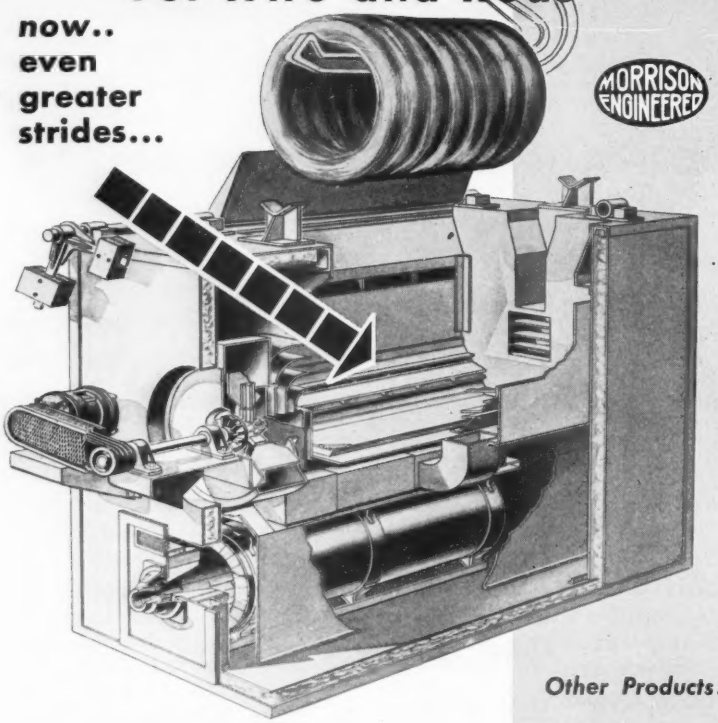
Years ahead...

Building Better

FLASH BAKERS

For Wire and Rods

now.. even greater strides...



Other Products:

Truck Type Bakers
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Morrison Flash Bakers have set the pace for the wire industry for many years — but today's Flash Baker built by Morrison is years ahead in design and performance.

A modern Flash Baker by Morrison can answer many of your problems... increase wire and rod baking capacity... speed up line production... reduce fuel and operating costs... and achieve a fine lime coating free of rust. When a Morrison specialist plans a job for you, you can be sure it will be the best.

Write or phone for complete details on the new, better Morrison Flash Baker.

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CLEVELAND 3, OHIO

Please have a MORRISON expert call at the earliest convenience.

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My Name .....
Address .....
City ..... State .....

of Technology; Vice-Chairman of the Board of Trustees of the National Safety Council; Treasurer and Trustee of the Malcolm Gordon School; Trustee of the Mutual Life Assurance Company of New York; Member of Council of the Copper Development Association (London), and member of the Governing Body of the International Chamber of Commerce.

* * *

MR. Stanley was elected an Ordinary Member of the Institute in 1928.

* * *

New Technical Book Catalog Available

A new, 1948 catalog of technical books has just been issued by **The Chemical Publishing Co., Inc.,** 26 Court Street, Brooklyn 2, N. Y. This catalog includes the latest books on chemistry, physics, science, technology, petroleum, medicine, foods, formularies, drugs and cosmetics, engineering, metals, technical dictionaries, building contsruction, etc.

* * *

THIS catalog, conforming with the requests of technical and scientific workers and librarians, gives the date of publication of each book as well as price, number of pages, detailed descriptions and full table of contents.

* * *

A copy of this catalog will be sent free to everyone who is interested in keeping up with the latest technical and scientific progress.

* * *

Bulletin on Metallographic Polishers

A new bulletin showing their line of re-designed Metallographic Polishing Machines for laboratories has been issued by **Eberbach & Son Co.,** who have manufactured a line of polishers for over 15 years. The units are sturdily constructed to give excellent performance and long life.

* * *

COPIES of this bulletin are available to our readers. Write to Eberbach & Son Co., Ann Arbor, Mich.

Outstanding Personalities of the Wire Industry

R. R. Tatnall Appointed Customer Relations Metallurgist for Colorado Fuel & Iron Corporation, Wickwire Spencer Steel Division

R. R. Tatnall has been appointed to the position of Field Service Metallurgist in charge of Customer Relations for **The Colorado Fuel and Iron Corporation**, Wickwire Spencer Steel Division, it has been announced by F. A. Webber, Chief Metallurgist. Mr. Tatnall has been connected with the company's Morgan Plant at Worcester, Massachusetts for twenty years, currently serving there as Quality Control Manager. He has been president of the Morgan Plant Credit Union since its inception ten years ago. He is a registered professional engineer in the State of Massachusetts and is connected with several technical organizations. He is a member of the American Society for Metals and served the Worcester Chapter as Chairman in 1934 and 1935. He is also a member of the Wire Association and served as Chairman of the Worcester Regional Meeting for a number of years. He was awarded honorable mention by the Wire Association for his paper on "Fatigue Properties of Spring." He has transferred to the company's Plant at Buffalo, New York

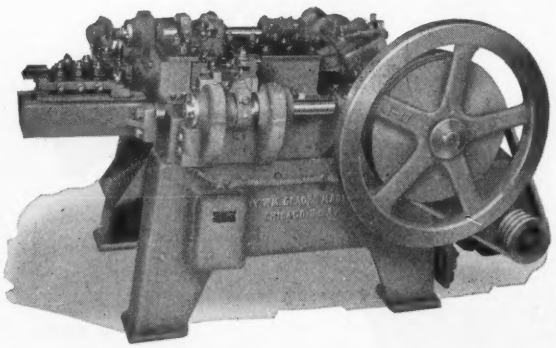
* * *

Howard Meredith Made Works Superintendent at American Steel & Wire Company's Rankin Works

HOWARD P. Meredith is the new Works Superintendent at **American Steel & Wire Company's** Rankin Works at Rankin, Pa., succeeding Charles J. Brown who is retiring after 38 years of service with this U. S. Steel subsidiary.

A native of Monongahela, Pa., Mr. Meredith was educated in the public schools of that city before matriculating at the Carnegie Institute of Technology, being graduated from that institution with a B. S. degree in works management. He first started working for American Steel & Wire in July, 1927, when he began as a special apprentice in the wire drawing department at the company's Donora Steel & Wire Works. In February, 1941, he was transferred to the now-abandoned Allentown Works as foreman of the nail department. Two years later, he was moved back to Donora where he held a variety of positions before being named superintendent of the finishing department in August, 1945. Since September, 1946, Mr. Meredith has been assistant works superintendent at Rankin.

GLADER HIGH SPEED WIRE NAIL MACHINE



MACHINE ARRANGED FOR INDIVIDUAL MOTOR DRIVE

High tonnage output, and low maintenance costs, have resulted in Glader Machines being accepted as standard equipment in every large nail mill built in the United States in the past twenty years.

Glader Machines are operating in most of the wire producing mills throughout the world.

These machines are made in eleven different types and sizes. This enables us to cover the range of sizes of nails produced with the greatest efficiency.

For further information please address,

WM. GLADER MACHINE WORKS

210 No. Racine Ave.
Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

New England Butt Company Appoints Chief Engineer

NEW England Butt Company, Providence, R. I., manufacturers of wire and braiding machinery, announces the appointment of **Everett M. Schenk** as chief engineer.

* * *

MR. Schenk has been associated, during the past eleven years, with the Wire & Cable Division of Western Electric Co., Kearny, N. J., in the capacity of development engineer.

* * *

Howard C. Williams Appointed Sales Manager Sheet Division Continental Steel Corporation

HOWARD C. Williams, since 1940 sales manager of the merchant trade division of **Continental Steel Corp.**, Kokomo, Ind., has been named sales manager of the sheet division of the company.

Joins Aluminum Import Corp.

LEO Reierstad, formerly sales manager of the **Chinese Aluminum Rolling Mills, Shanghai**, associated with Aluminum Limited, has joined the staff of the Aluminum Import Corporation, in charge of its New York sales office.

* * *

ALUMINUM Import Corporation is distributor in the western hemisphere for all of the products of the Aluminum Company of Canada, Ltd., and other manufacturing units in the Aluminum Limited group of companies.

* * *

H. B. Bassett Elected President Acme Wire Co.

HERBERT B. Bassett, formerly vice president of the **Acme Wire Company**, has been elected president by the board of directors to succeed Thomas G. Nee who was elected to the new office of chairman of the board. Brower Hewitt, formerly treasurer, was elected to be vice president and treasurer. Charles J. Schnelle was reelected vice president and James E. Wheeler was reelected secretary.

* * *

S. W. Farnsworth Is Reelected President Torrington Mfg. Co.

S. W. Farnsworth was reelected president of the **Torrington Mfg. Co.** at the annual meeting of the stockholders. Other officers elected at the annual meeting were: senior vice president, Robert S. Storrs; vice president in charge of manufacturing, Gustav H. Froelich; vice president in charge of sales, Donald G. Leslie; treasurer, Herbert C. Schick; secretary, Roderic M. Cross; assistant secretary and treasurer, Charles P. Bennet.

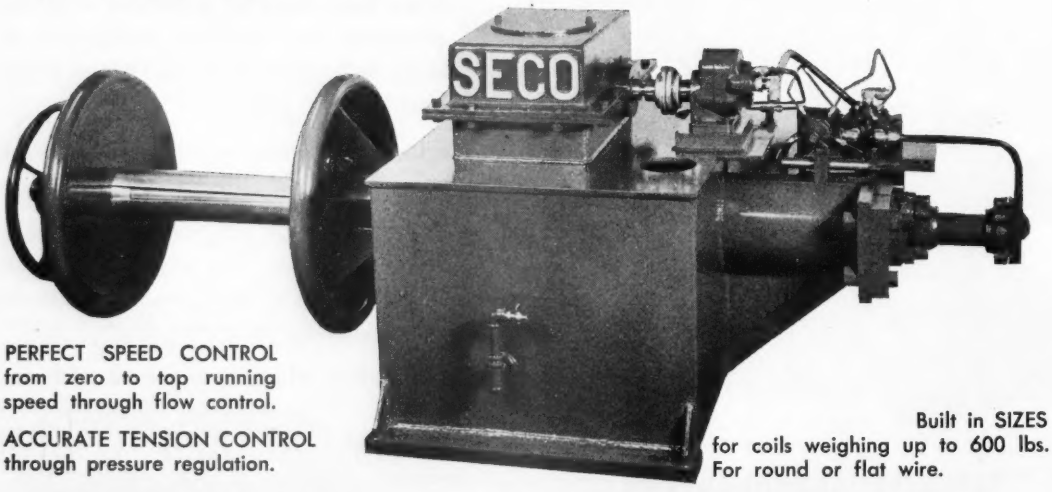
* * *

Atlas Steels Ltd. Appointment

F. F. Bain has been appointed to the newly-created position of stainless steel service metallurgist with **Atlas Steels Ltd.**, Welland, Ont.

TRAVERSE REELS *Hydraulically* OPERATED

WIRE SPOOLERS, Single & Multiple Type



PERFECT SPEED CONTROL from zero to top running speed through flow control.

ACCURATE TENSION CONTROL through pressure regulation.

Built in SIZES for coils weighing up to 600 lbs. For round or flat wire.

STEEL EQUIPMENT COMPANY

2890 East 83rd Street — F. JULES KELLER, *President* — Cleveland 4, Ohio

He was with the Eastern Rolling Mills Co. from 1931 to 1935 as assistant metallurgist. In 1936 he joined Rustless Iron & Steel Corp., Baltimore. In 1947 he was chief metallurgist of the Baltimore Castings Corp. and at the same time was retained by Atlas Steels Ltd. as stainless steel consultant.

* * *

Dr. Osborne, Jr., Appointed Technical Director of Tocco Division of Ohio Crankshaft Company

OHIO Crankshaft Co., Cleveland, announces the appointment of **Dr. H. B. Osborn, Jr.** to the post of technical director of the company's Tocco Division. Dr. Osborn will devote his time to exploring and developing new fields for induction heating equipment. He joined the company in 1940 as research and development engineer, and in 1946 was named sales manager of the Tocco Division.

Harris to Manage New Decatur Plant for G. E.

CHARLES H. Harris has been named manager of the new Decatur, Ill., Works of the **General Electric Plastics Division**, according to an announcement made by George P. Lehmann, division manager.

* * *

MR. Harris first came with General Electric in 1930, shortly after his graduation from Washburn College. He joined the Plastics Division in 1934.

* * *

HE was assigned to the Fort Wayne Works of the Plastics Division in 1936 and in 1944, was named assistant to the manager. He transferred to Decatur after General Electric purchased that plant last year.

* * *

A. S. & W. Appoinment

STUART W. Goodenough has been appointed assistant manager of the manufacturers products sales department, Chicago, of **American Steel & Wire Co.**, subsidiary of United States Steel Corp., succeeding C. J. Quill, deceased.

* * *

HE first entered the employ of American Steel & Wire Co. in October, 1926. He worked in various divisions and since 1945 he has been on the staff of the general manager of sales located in Cleveland.

* * *

R. G. Huntress Made Manager Wire Rope Sales, Colorado Fuel and Iron Corporation, The California Wire Cloth Corporation, Subsidiary

R. G. Huntress has been appointed Manager of Wire Rope Sales for **The California Wire Cloth Corporation**, a subsidiary of The Colorado Fuel and Iron Corporation. Mr. Huntress graduated from Wentworth Institute in Boston. He joined Wickwire Spencer Steel Division in

THE WIRE ASSOCIATION will hold the

SAN FRANCISCO REGIONAL MEETING

on June 4, 1948, at the Sir Francis Drake Hotel

The meeting will start with registration at 9 a.m. for the Columbia Steel Company Plant Inspection. Busses leave the hotel at 10:30 a.m.

Dinner will be served at 7 p.m. at which Kenneth Smith, President of the California Redwood Association will be guest speaker.

The Technical Session starts at 8:30 p.m. with papers on "The Use of Wire Coating Compounds" by Harold L. Trembicki, Magnus Chemical Company, and on "Powder Metallurgy" by Herbert B. Clark, Vascoloy-Ramet Corporation. Following the papers a sound motion picture "Watts in Glass" will be shown through the courtesy of the Owens-Corning Fiberglas Company.

For information on reservation, please write or telephone Earl R. Potter, Industrial Wire Products, 2417 17th Street, San Francisco, California. Mr. Potter will serve as chairman of the meeting.

ALL PACIFIC COAST WIRE MEN ARE URGED TO ATTEND

It will be a good meeting. Please come!

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

300 MAIN STREET STAMFORD, CONN.

Tickets: $5.00 each.

1937 and has held the positions of Assistant to the Superintendent of the Wire Rope Mill at Palmer, Mass. and later Wire Rope Sales Engineer. During World War II, he served with the United States Navy. He will operate out of the Oakland, California office to serve the Pacific coast area.

* * *

Dr. Hutcheson Named Director of Westinghouse Research Laboratories

DR. **John A. Hutcheson** has been appointed director of the **Westinghouse Research Laboratories,** succeeding Dr. L. Warrington Chubb.

* * *

DR. Hutcheson assumes his new post after four years as associate director of the Laboratories. During this period he directed the company's extensive wartime radar research program and later the formulation of plans for atomic energy development. He will remain active in both fields.

Waterbury Farrel Appointments

WATERBURY Farrel Foundry & Machine Co., Waterbury, Conn., announces the re-election of **David C. Griggs** as chairman of the board; **R. L. Wilcox,** president; **Z. P. Candee,** vice-president; **L. S. Reed,** treasurer; **E. A. Anderson,** secretary, and **A. Dale Mitchell,** controller and assistant treasurer. The company also announces the following promotions: **Irving H. Toles,** assistant secretary, to vice president and director; **Joseph H. Schaffer,** engineer in charge of Bolt & Nut Machinery Division, vice president; **F. S. Van Valkenburg,** engineer in charge of Eyelet and Wire Drawing Machinery Division, vice president; and **William T. Bannon,** personnel director, to assistant secretary. All four officials promoted have been affiliated with the company for 30 years or more.

* * *

Timken Roller Bearing Personnel Changes

BLAIR **Glenn,** general superintendent of the Canton Bearing Division of the Timken Roller Bearing Co., Canton, Ohio, has been promoted to assistant factory manager of the Canton Bearing Div. **Henry Tobey**, Canton Bearing factory metallurgist, has been appointed general superintendent of the Canton Bearing factory succeeding Mr. Glenn. **Fred Barnard,** assistant Canton Bearing factory metallurgist, has been appointed Canton Bearing factory metallurgist succeeding Mr. Tobey. **Joseph Selby** has been appointed assistant Canton Bearing factory metallurgist, succeeding Mr. Barnard. **Russell P. Fowler,** assistant general superintendent of the Columbus plant, has been appointed superintendent of the Bucyrus Bearing factory, where operations are scheduled to begin early this spring.

* * *

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WIRE & PROCESS MACHINERY

Standard and Special Equipment for the Wire Industry

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John P. Elton

JOHN P. Elton, 82, identified with many of the leading industries in Connecticut and a former mayor of the city of Waterbury, died early in March in his sleep at Pinehurst, N. C. He had been vacationing there for the past five weeks. He was a native of Waterbury and a descendant in the eighth generation of John Elton, founder of the family in Connecticut prior to 1672. His grandfather, John Phince Elton, was one of the founders of the brass industry of Waterbury. Mr. Elton served as treasurer of the American Brass Co. for a period of 25 years. He was a director of the Scovill Mfg. Co., Landers, Frary & Clark Co., New Britain, the American Hardware Co., New Britain, Torrington Mfg. Co. and numerous other manufacturing concerns.

* * *

John Connell Aiken

IT is with real regret that we announce the passing of **John Connell Aiken** on March 13th, 1948. Mr. Aiken was Assistant Superintendent of the Rod and Wire Department of the Jones & Laughlin Steel Corporation, a member of the Wire Association and winner of the Wire Association Medal Award for the year 1943.

* * *

JOHN Connell Aiken was born in Pittsburgh, Pa., on May 18th, 1895. He attended grade and preparatory schools in Pittsburgh and graduated from Washington & Jefferson College in 1916 with a Bachelor of Science Degree. He served in World War I in the U.S. Navy Mine Laying Squadron aboard the U.S.S. Housatonic and later aboard a troop transport after the Armistice. From 1919 to 1923 he was employed by Oliver Iron & Steel Corporation of Pittsburgh in the bolt and nut business. He became associated with the Jones & Laughlin Steel Corporation, Rod & Wire Dept. in 1923, becoming Rod & Wire Mill General Foreman, which position he held until 1935 when he became Assistant Superintendent, Rod & Wire Mill Department. With the exception of a few months spent at Hamilton, Ontario, Canada, he held this position until his death.

To....

WIRE MILL MEN

Have you considered joining the Wire Association? You are cordially invited to become a member. Dues are $15.00 a year, which includes a subscription to WIRE & WIRE PRODUCTS and a copy of the Annual Buyers Guide.

THE WIRE ASSOCIATION

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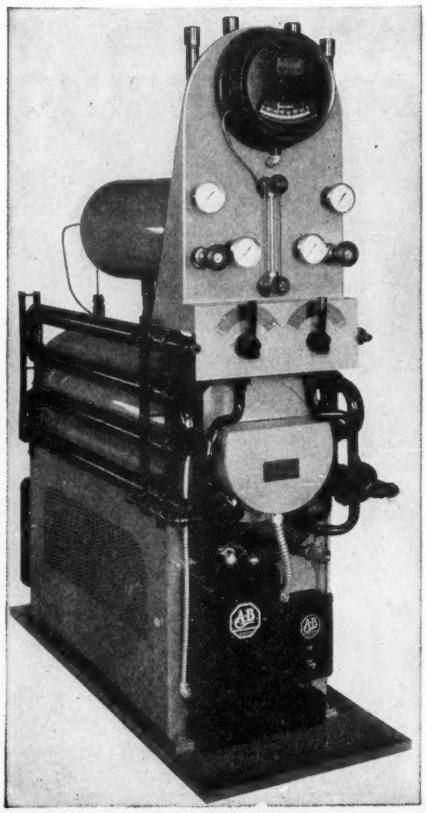

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A compact, simply operated unit designed to sustain any pre-determined temperature between 90°F and 475°F. — Hand-lever selection of desired temperature — Heat supplied — or drained — according to operational requirements — Formed piping, elimination of gaskets, and drip pans promote cleanliness — Breakdown of heat transfer oil reduced to a minimum — Three standard sizes 16KW, 32KW, 48KW — Other units with water circulation and refrigeration for operations requiring constantly maintained lower temperatures, 35°F to 200°F.

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PATERSON 3, NEW JERSEY

A Review of Recent Wire Patents

No. 2,436,984, ELECTRICAL CABLE, patented March 2, 1948 by Arthur L. Wilson, Brentwood, Calif.

More specifically this invention is to a binding for holding a bundle of wires in cable form and comprises a number of bands of plastic material wrapped around the bundle at spaced intervals and subjected to pressure to form an intimate bond therewith, and hangers extending from the bands to facilitate mounting the cable, these bands forming an insulation isolating the hangers from the wires.

* * *

No. 2,437,528, HIGH-TEMPERATURE CLEANING OF STEEL STRIP, INCLUDING REMOVING FERROUS CHLORIDE THEREFROM, patented March 9, 1948 by Ralph W. Hodil, near Toledo, Ohio, assignor to Surface Combustion Corporation, Toledo, Ohio, a corporation of Ohio.

The method comprises passing the steel through a bath of molten lead at a temperature above the freezing temperature of the chloride so as to remove the chloride from the steel by flotation.

* * *

No. 2,437,630, WIRE PAY-OFF MECHANISM, patented March 9, 1948 by Morris F. Williams and Seymour B. Gallt, Syracuse, N. Y., assignors to Crucible Steel Company of America, New York, N. Y., a corporation of New Jersey.

This mechanism includes a coil supporting frame having a portion receivable within a coil of wire to be unwound, mechanism for continuously pulling the wire in a direction endwise of the frame, guides for producing a revolving outwardly whipping motion of the wire in passing from the frame to the pulling mechanism, a tiltable platform for supporting the frame, and means operable upon abnormal tilting movement of this platform in a direction toward the pulling mechanism for throwing the latter out of action.

* * *

No. 2,437,708, SEMICONDUCTING TAPE FOR ELECTRIC CABLE, patented March 16, 1948 by Curtis Edward Plass, Worcester, Mass., and David Joseph Sullivan, Fairfield, Conn.; said Sullivan assignor to E. I. du Pont de Nemours & Company, Wilmington, Del., a corporation of Delaware; said Plass assignor to The American Steel and Wire Company of New Jersey, a corporation of New Jersey.

About the wire conductor is a layer of oil-impregnated insulation, and an oil-impervious organic electric shielding layer over and in contact with the insulation, the shielding layer containing approximately .25 part to 4 parts of an alcohol-soluble synthetic linear polyamide, having an intrinsic viscosity of 0.4, a unit length of at least 7, and an average of at least 2 carbon atoms separating the amide groups.

Complete Description and Drawings of Patents May Be Had for 50 cents, outside the United States and Canada $1.00. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

* * *

No. 2,437,725, WINDING MACHINE, patented March 16, 1948 by Edward A. Conner, Stratford, Conn., assignor to American Chain & Cable Company, Inc., Bridgeport, Conn., a corporation of New York.

This machine is said to be adapted for forming coils of even successive layers of line of the type including a device producing winding motion and relative traversing motion between a line guide and the coil being formed. With the construction disclosed a dwell is produced in the motion of a carriage, mounted for movement to cause relative traverse, at the end of traverse.

* * *

No. 2,438,240, METHOD FOR STRAIGHTENING RODS, patented March 23, 1948 by Andre Joseph Trudeau, Waterbury, Conn., assignor to Chase Brass & Copper Co., Incorporated, Waterbury, Conn., a corporation.

The method is employed for simultaneously straightening two rods or the like by employing straightening rolls with their axes in angularly crossed relation.

ADVANTAGES WORTH CONSIDERING

When in the market for cable lacquers, insulating finishes, or impregnating compounds, consult us and have at your command:

1. SPECIALIZED RESEARCH EXPERIENCE
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and

5. 77 YEARS OF KNOWING HOW

Our Hot Melt, *Flame Resistant, Non-Toxic* Compounds are most widely used for AF and CF wires.
Your inquiry is invited.

STANDARD VARNISH WORKS

Engineers of Product Finishes

NEW YORK — LINDEN, N. J. — CHICAGO

Serving Industry For 77 Years

No. 2,438,386, BUNDLE BINDING MACHINE, patented March 23, 1948 by Paul A. Chamberlain, Chicago, Ill., assignor to Signode Steel Strapping Company, Chicago, Ill., a corporation of Delaware.

A support is provided for holding the bundle in binding position, and associated therewith are a feeder for feeding binder forward from a source of binder supply to the binding position to enable the operator to loop it about the bundle; a device for guiding the free end of the binder to a sealing position lapping the binder from the source; a gripper for pressing the binder near its free end against the bundle to cause this end to be anchored. There are also tensioning means for retracting the binder to shrink and tension the loop thereof upon the bundle; sealing means for deforming the lapping portions of binder to form joint therebetween to render the tensioned loop permanent and a cutter.

* * *

No. 2,438,700, WIPER OR DIE FOR USE IN THE COATING OF WIRES, patented March 30, 1948, by Hugh Charles Hoban, Dartford, England, assignor to W. T. Henley's Telegraph Works Company Limited, Dorking, England, a British Company.

A wiping die for use with the application of enamels, lacquers or the like to wire is provided and comprising a piece of sheet metal divided by a cut extending inwards from one edge of the piece to and beyond a hole forming the die aperture towards the opposite edge of the piece, into two limbs united by a body portion whose minimum dimension in the plane of the piece is at least several times as great as the thickness of the piece, whereby the two limbs are substantially incapable of relative elastic movement in the plane of the piece but are readily elastically deflected in opposite directions from this plane to form a tapering opening leading to the die aperture.

* * *

No. 2,438,732, ELECTRON TUBE CATHODE, patented March 30, 1948 by Paul D. Williams, Palo Alto, Calif., assignor to Eitel-McCullough, Inc., San Bruno, Calif., a corporation of California.

The cathode comprises a body of sintered thorium oxide, and a metallic carbide incorporated in the cathode.

* * *

No. 2,438,798, MANUFACTURE OF STRAIN-INSENSITIVE STEEL, patented March 30, 1948 by Henry M. Banta, Pittsburgh, Pa., assignor to Jones & Laughlin Steel Corporation, Pittsburgh, Pa., a corporation of Pennsylvania.

The method of this patent is for making steel having a reduced strain-sensitivity, and comprises forming a basic open hearth heat containing iron oxide and limestone and having about 1.25% to 1.80% carbon at melt-down of the metallic charge, and oxidizing the carbon intensely and rapidly under a slag the percentage CaO to SiO_2 ratio of which is maintained under 2.3 so that the carbon is not over about .80% when the limestone charge is about half melted, whereby nitrogen is reduced to low value.

Morse Chain Announces New Line

THE Morse Chain Company, Detroit, has announced an entirely new series of Silent Chain Stock Drives.

* * *

TOOLING has already been completed for the ½-inch and ¾-inch pitch chain sizes made to the new Silent Chain Standards. The program will cover both sprockets and chains.

* * *

ALL phases of the power transmission industry are expected to benefit by the new Morse Silent Chain Standardization Program.

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YOUR ORDER NOW
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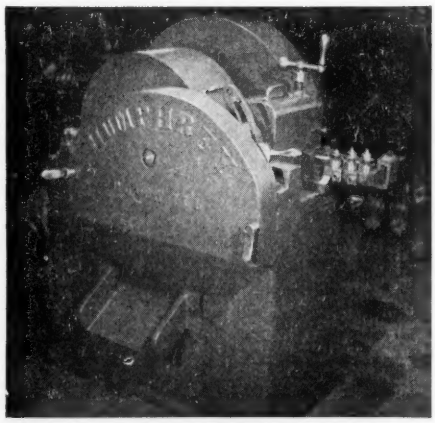
1948 WIRE BUYERS GUIDE

1000 STAPLES PER MINUTE!!!



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Fastest Staple Cutter Ever Made — Makes Two Complete Staples at each revolution — Compact, Easily Adjustable, Efficient.

48 Different Leg Lengths, Gauges 9 through 18

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HUMPHREY RAPID STAPLE CUTTER

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THE BRITISH SITUATION

Our correspondent reviews present conditions in Great Britain

THE whole world is well aware of the national troubles which are being experienced by Britain in her attempts to overcome the economic situation brought about as part of the aftermath of World War II. Ways and means of bringing the country back to its earlier eminent level are exercising the brains and ingenuity both of the Government and of the industrialists. That the problem will be coped with satisfactorily there is, of course, no doubt. But, faced with exertion and relative scarcity of materials, both raw and manufactured, the British industrialist is confronted with yet another immediate problem — that of making restricted capital travel the maximum industrial distance.

Statistics of Failures

FOR many years now statistics have been carefully compiled of the British companies and partnerships which meet with financial difficulty. There has, during the long period capable of review, been a high degree of steadiness in the totals of those who have failed but one thing stands out very noticeably. It is that during a period of War — such as 1914-1918 and again from 1939-1945 — the number of business which get into low financial water sinks to a very small total. In fact, during 1944 the number of firms which failed attained an all-time low. But that was in 1944 and during a period of war.

* * *

WHEN 1945 and the end of the war arrived, so did this honeymoon period of financial bliss, begin to deteriorate. During the second half of 1945 as many businesses failed as during the whole of the year previous. 1946 and 1947 watched a continuance of this increasing tendency and although, in 1948 it is too early to say how the totals will compare with the years before World War II, it is already very obvious that the decline continues apace.

Why is this?

IT is not necessary to look so very far to determine the factors behind these tendencies. During periods of warfare, industry of all classes is geared to the machinery of Government. Output is everywhere directed towards the upholding of military needs: the Government is, to all intents and purposes, the sole customer. And, working for the Government in times of war it is almost impossible to go astray. Prices are subject to control, it is true, but the margins allowed and the demands for production made are always such as to allow a living. It is unfortunate but true that periods of war bring into all branches of industrial life a strata of producing activity which is of no great credit to the commercial walks to which adherence and allegiance is pledged. Business houses, both manufacturing and merchanting, spring up overnight like mushroom growths and when the cessation of war brings a cessation of military orders, so do the mushroom businesses begin to fold up and die. The process may be somewhat protracted

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PRECISION - Our Motto

DON'T hesitate to call on us when you are confronted with wire-straightening problems involving close tolerances and absolute accuracy. For seventeen years we have specialized in straightening and cutting all gauges of fine wire, hard or soft, ranging in diameter from one-sixteenth of an inch down to five-thousandths of an inch. We employ gun-barrel accuracy in straightening lengths from one inch to ten feet or any fractional part thereof. Ends cut absolutely clean without burrs.

ASK ABOUT OUR UNEXCELLED FACILITIES FOR CLEANING AND POINTING WIRE ALREADY STRAIGHTENED AND CUT.

ALL TYPES OF WIRE...

- Nickel
- Stainless Steel
- Bronze
- Brass
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and, viewed from some angles, the greater the delay the greater is the pity. Many firms came into industry not from motives of altruism but seeking the quick profits which were there for the taking. Profits were not ploughed back but were frequently dissipated. Commencing with no capital backing, none was set aside. The end of the war meant that such businesses were finished for good and all. Others may have tried to accumulate reserves and, to some degree, success was achieved. But these reserves prove to be entirely inadequate in the hurly burly of competitive life when the great change over to peace time production is necessary. So do more firms retire from business but their demise is a slow one. These two years and more since the end of World War II have been a real and proper testing ground and this comment is not restricted to business firms in Great Britain — its application is universal.

* * *

What is left?

AND so, in the middle of 1948, we find, in general industry, a basis of old established, capably managed and fundamentally sound producers and merchants and, intermingled with them, a representative proportion of the war-time foundations which are hanging on. It is, of course, quite true that all businesses borne of war will not be ejected voluntarily or involuntarily from commercial life but, as they do retire, they leave behind them a sense of dis-satisfaction and a chain of bad debts.

* * *

DURING the war the older firms were forced to operate their machinery to an extent possibly unknown in the annals of production. Replacements are now necessary and these replacements are difficult to come by and are very expensive. Liquid resources are depleted to make good the war depredations. During the war it was possible to defer payment of taxation dues on the understanding and because every available item of cash was required for re-investment in production. It is now necessary to face up to these deferred liabilities and to make arrangements for their payment. This means still deeper inroads into liquid funds. During the war and for the months immediately following the majority of sales were made against immediate cash payment. The sellers' market of 1946 and 1947 was one long holiday from financial worry. Everyone who wanted to buy had cash available. At the end of 1947 and in 1948 the spirit of competition has returned both in domestic and international trading. Customers, particularly those abroad are wielding the credit axe as an implement of accepting an order or going elsewhere. Thus has competition caused still greater restriction of liquid funds.

* * *

Where it all leads

THE upshot of all this is that the British manufacturer and merchant — and their counterparts throughout the trading world — are faced with the necessity of extending credit facilities to an unexpected degree. In Britain, as an instance, the drawing on bank loans for cur-

1926 — pioneered the first practical controlled-atmosphere furnace

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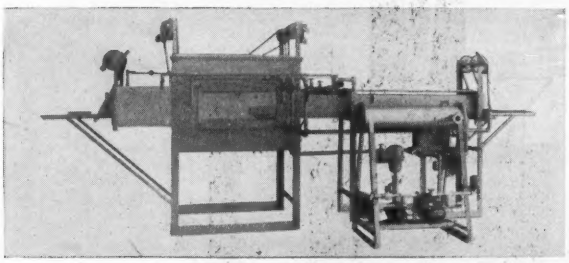
"CERTAIN CURTAIN" ELECTRIC FURNACES



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For CLEAN annealing, copper brazing, silver soldering in Controlled Atmosphere

The famed "Certain Curtain" control conquered the most difficult atmospheric problems in high speed steel treating. These same patented methods are available in equipment expressly designed for clean annealing, copper brazing and silver soldering at temperatures up to 2000°F. Conveyor and batch types. Additional external atmosphere generator available. "Certain Curtain" equipment dissociated ammonia or hydrogen assuring the utmost in economical protection for every operation.

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rent finance has reached a limit never before known and the borrowing from a bank will normally involve the pledging of assets as security. Over here such a pledging takes the form of a debenture issue and a debenture giving a first charge on the assets which it covers, the position of the ordinary trade creditor who has no tangible security, is forthwith prejudiced. Thus the creditman has to weigh up whether his customers whose assets are pawned merits the longer (and therefore larger) credit which is expected. And again there are many business houses who overrun the period of credit agreed at the time of making the sale. Latitude and days of grace are part and parcel of the commercial give and take but when money is expected and taken into consideration, non-payment is apt to be disconcerting.

* * *

THERE are, of course thousands upon thousands of business houses which continue to respect the promises which they have made. They are usually among the old established firms where honour is still a talent to be respected. If they require a little extra time, they will go the right way about things, lay their cards on the table, explain their temporary position and get that which they require. By so doing they earn respect and cement goodwill.

* * *

BUT the others, and they appear (and dis-appear) wherever trade is conducted, who just do not pay, who dither, who squirm, who avoid, who argue and who dodge the column, are the businesses which are likely to bring any industry into disrepute and their creditors to a degree of despair and financial embarrassment.

* * *

THE employment of debt collecting agencies has advanced by leaps and bounds and is likely to continue to do so for some time to come. In the years and months which lie ahead it will be possible to effect a high degree of sifting the commercial sheep from the industrial goats. Financial stringency is not greatly feared among the old established businesses with years of service to their line of business. Every war carries in its train a number of financial disasters, some great and some small, but, at the moment the drafting of 'collection letters' and the adhesion of 'stickers' is claiming a greater proportion of time than the average trader can afford to spare.

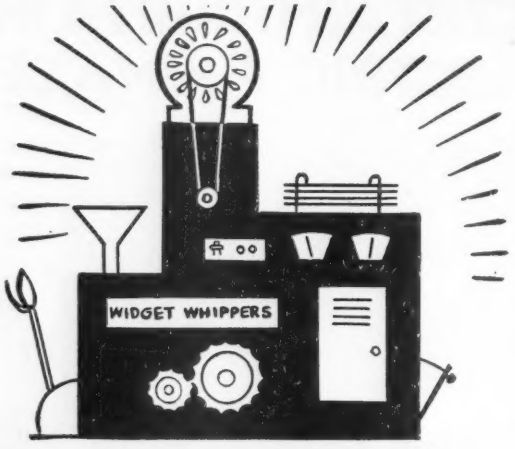
* * *

New Bulletin on Tungsten Carbide Bushings

APPROXIMATELY 800 sizes of standard Talide (Tungsten Carbide) drill jig bushings are listed in a new bulletin, #BC-48, issued by **Metal Carbides Corporation,** Youngstown 5, Ohio. This is the first time solid carbide bushings have been offered to the trade in such a wide assortment of sizes and at such low prices. All items are in stock for immediate shipment.

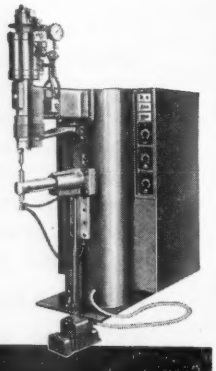
An ADVERTISER likes to know his ads have been read so please mention WIRE & WIRE PRODUCTS when writing him.

Whether you make Whippers



. . . or pots and pans, or trucks, or stoves, or any product fabricated of metal . . . you'll be interested in the story of Mr. Widget. He was faced with the dilemma of wanting to use resistance welding but not having sufficient plant transformer and distribution facilities to handle the extra load. Also the power people frowned on the addition of a *low power factor* load.

How Mr. Widget became a "Man of Success" with the aid of "THREE PHASE" is briefly told in the booklet; "How Mr. Widget Made More Whippers." Your copy is waiting—just drop us a post card. You'll find it well worth the 3 minutes reading time (not counting technical stuff.)



Manufacturers of a complete line of resistance welders. Offices in New York, Detroit and Dayton. Representatives in Principal Cities

SCIAKY

SCIAKY BROS. Inc., 4923 WEST 67th STREET, CHICAGO 38, ILL.

Measurement of Wire Diameter Without Contact

THE continuous non-contact measurement of wire diameter by electronic means is now being used in a number of Eastern wire mills with very satisfying results. The instrument being used is relatively new and is sold under the copyrighted name "DIAMATROL". It consists of an inspection head, a power and control unit and a directly calibrated indicating meter.

* * *

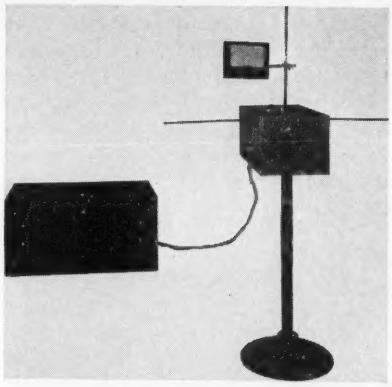
THE circuit used in this instrument seems to overcome many of the difficulties experienced in some earlier attempts to solve this problem electronically. It is compensated for line voltage variation to plus or minus 5 volts, as well as aging of components. It operates on 110 v, 60 c, single phase current. It is equipped with an adjustable control which provides electronic meter damping whereby rapid or repetitive fluctuation in diameter may be average.

* * *

THE DIAMATROL can be used either as an absolute micrometer in the laboratory to determine wire or cable diameter, instrument to indicate continuously deviations from established nominal diameter. The meter has a zero-centered scale about 8" in length. It can be calibrated to read full scale deflection for plus or minus .0005" (equivalent to an amplification factor of 8000 to 1) or plus or minus .015" or more, or any range between. The scale is constant and linear throughout the range of the instrument. It is provided with connections for additional meters or for external recording indicators. Special units are built incorporating external controls for sounding alarm or lighting signals when tolerances are exceeded. Special units are also built wherein the output can be used to actuate servo systems to control machine feeds or speeds.

* * *

AN installation in one mill is being used successfully to check the diameter (about .050") of insulated wire. In this mill, the inspection head is located immediately following the wire covering machine, so that the speed of extrusion can be adjusted to hold finished diameter within tolerance. This installation operates at speeds exceeding 3000' per minute.



Harrington Engineering Co. Instrument for Measuring Wire Diameter. * * * *

* * *

THE accompanying photograph shows the power supply unit, the inspection head and the indicating meter. If it is desired to determine the diameter of wire of unknown diameter, the micrometer adjustment located on top of the inspection head is adjusted until the indicator reads on scale. The

All Metal
WIRE SPOOLS

Light weight; all-steel, lithographed.
5", 6½", and 10½" diameter ends.
Ends and traverses may be shipped unassembled.

We also produce spools for fine and magnet wire.

J. L. CLARK MANUFACTURING CO.
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sum of the two readings, micrometer and indicator, is the current diameter of the sample. If it is desired to read deviations from an established nominal diameter the micrometer is initially set for that reading. The meter then indicates deviations from the micrometer setting.

* * *

UNITS have been built with pressurized inspection heads to dissipate vapors or fumes from extruded insulated wire. Units have also been built to permit the inspection of hot wire.

AT the present time this equipment is made in three sizes capable of checking wire diameters in the following ranges: (1)—from .001″ to .080″. (2)—from .050″ to .300″. (3)—from .100″ to 1.00″. Special units can be built to measure diameters above 1″.

* * *

FROM all indications this equipment presents a new technique in the accurate non-contact measurement of wire or cable diameter. It is built by the **Standard Electronic Research Corp.** and sold by the **Harrington Engineering Co.**, Chysler Bldg., New York 17, N. Y., who will be glad to furnish details.

* * *

Bulletin Describes Heating of Copper and Brass

HEATING and annealing of copper and brass and other nonferrous alloys in 'Surface' furnaces is described in a new 4-page Bulletin, No. SC-136, just issued by **Surface Combustion Corporation**, Toledo 1, Ohio.

* * *

THE bulletin, appropriately illustrated, shows recommended methods of heating and heat treating slabs, sheets, strip billets and coils and also shows furnaces for copper, brass, nickle, silver and precious metals. Both direct and radiant tube fired furnaces and those using 'Surface' Prepared Atmospheres are shown.

* * *

THE bulletin also contains a chart showing the effect of annealing temperatures on high brass.

* * *

Scientific Bibliographies Available

NUMEROUS rare and unpublished bibliographies on scientific and technical subjects are now available to industry as the result of the formation of a pool of unpublished bibliographies by the Special Libraries Association. The bibliographies in each case have been compiled by technical librarians affiliated with the Association, many of whom are outstanding literature searchers in their respective fields.

* * *

THE pool is housed in the library of Battelle Institute, Columbus, Ohio, from which loans of the bibliographies are made. Anyone interested in obtaining the complete listing of the bibliographies should write Ralph H. Topp, technical librarian of the Batetlle Library, who serves as chairman of the SLA Bibliography Committee. His committee is also interested in the possible inclusion of other unpublished bibliographies in the pool.

PICTURE OF PROGRESS

Straight-line pickling of rod in RODINE-inhibited acid. RODINE makes available more rod for drawing—by protecting metal from acid attack.

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RUST PROOFING AND PAINT BONDING
Granodine ®
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Rodine® MEANS EFFICIENT PICKLING

"RODINE" is your key to efficient and economical pickling. "RODINE" inhibited acid removes scale and rust—cleans large surface areas with minimum acid and metal loss.
The new era of pickling with "RODINE" has replaced needless waste with savings in acid and metal that more than pay for "RODINE".

Pioneering Research and Development Since 1914
AMERICAN CHEMICAL PAINT COMPANY
AMBLER, PENNA.
Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

Continuous Annealing of Soft Drawn Copper Wire

(*Continued from page* 393)

water circulated from the base tank through the vertical pipes.

* * *

ONE of the Fine Wire Drawing Machines with its annealing unit is shown in Figure 6. This is similar to the Intermediate Machine set up except that the wire is returned to the spooler that is attached to the machine instead of passing on through to a detached spooler. These machines draw sizes .0126″ to .005″ at 5000 feet per minute, taking up the wire on 100 pound spools.

* * *

ALTHOUGH the applications described cover the use of the continuous annealing process on modern high-speed machines, experience has shown that this method may be used on almost any kind of wire drawing equipment. Each installation presents special problems and the design must be worked out with proper consideration for the material to be annealed, speed, size of reels, available space and other factors involving subsequent operations.

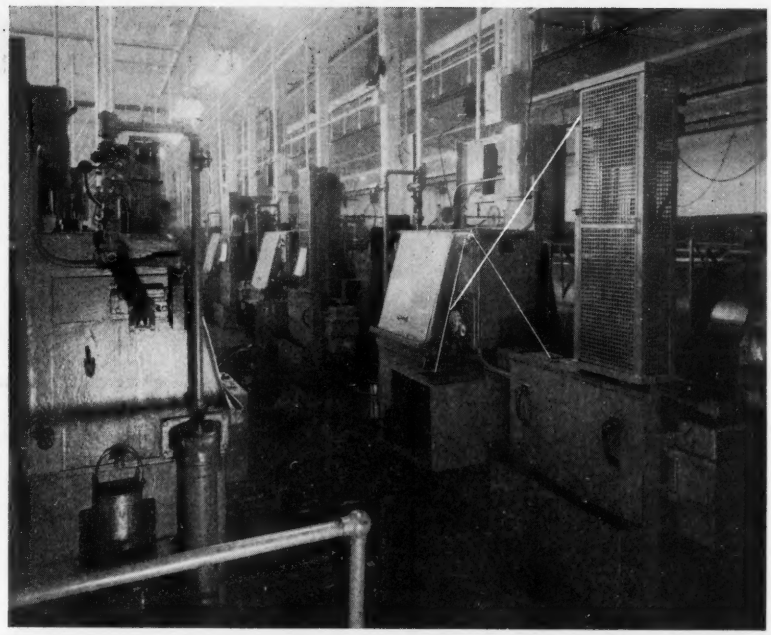


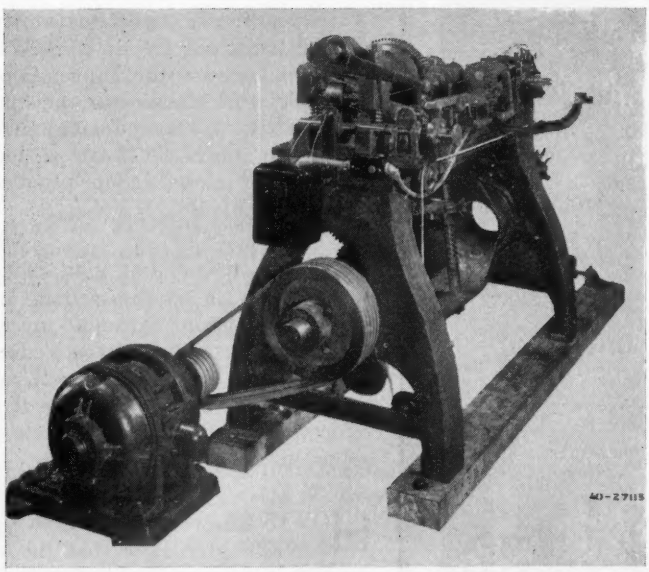
Fig. 6. — Another view of Wire Drawing Machine and the Annealing Unit * * *

* * *

SO far, existing installations have been limited to a maximum finished wire size of .144″ diameter, but undoubtedly heavier equipment could be developed if there were need for the annealing of larger sizes in sufficient quantity.

* * *

GLADER BARBED WIRE MACHINE



Used Throughout the World

Machine can make 2-point or 4-point Barbed Wire. Both types can be made on the Glader Combination Machine. Changeover requires about 15 minutes.

Maximum production — One man can operate two machines easily, efficiently.

Glader Barbed Wire Machine also makes 2-strand plain cable wire, without barbs.

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EXPORT DEPARTMENT, WM. GLADER MACHINE WORKS

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LABOR RELATIONS

by John B. Stone,
Washington, D. C.

The thirteenth in a series of articles on the subject, with particular reference to problems of the wire and wire products industry. The author is a noted authority on the subject.

ACTION of the Federal Court in Indianapolis in enjoining the International Typographical Union from striking to enforce its no contract policy and the decision of the union to comply with the injunction constitutes the most important development in the American Labor movement since passage of the Taft-Hartley law.

* * *

THOUGH the union involved in no way touches the Wire and Wire Products business, implications of the event may have a far reaching effect upon the labor relations of manufacturers in that field.

* * *

ISSUE at stake in the ITU strike in Chicago and elsewhere was the demand of the union that working conditions be determined not by a contract but by bulletin board notices of conditions of employment.

* * *

IN this way the union hoped to avoid the clause in the Taft-Hartley law which forbids the closed shop. The union, which is one of the oldest and generally most conservative AF of L affiliates has long had a closed shop policy.

BY having conditions of employment posted on the bulletin boards the union hoped, and in many instances outside of Chicago, succeeded in avoiding the ban.

* * *

WHEN the injunction was first issued, a few hot-headed leaders within the union had declared they would continue the strike and refuse to negotiate contracts. However, the national leadership was quick to comply and had a sample contract drawn up and approved by General Counsel Denham of the NLRB as a preliminary to negotiations in Chicago and other trouble spots.

* * *

THE union decision seems to indicate that the tactic of battling the Taft-Hartley law on the picket line has been given up by the ITU in favor of the more orderly and less costly method of fighting the law through political action.

* * *

THE decision is important to manufacturers of Wire and Wire Products because the International Association of Machinists, the huge independent union, and many AFL unions in the field have a long tradition of closed shop practices like those of the ITU.

* * *

IT appears that rather than chance the issue in strike action and invite retaliation through injunctions and the power of the Federal Government, these unions will continue at work and concentrate their efforts to regain the right to closed shops in the political field.

* * *

HOWEVER, veteran observers in Washington note that the recent developments in enforcement of the Taft-Hartley law have led to a rising spirit of militancy among locals in the larger unions and they

REELS OF WOOD

RETURNABLE and NON-RETURNABLE

Furnished assembled or knocked down, made to your specifications. Will withstand severest handling. Sturdy, strong, low in cost. Made for

CABLE, ROPE and WIRE

in any size from 12" to 96" in diameter.

ALSO, REEL HEADS FOR STEEL DRUMS

Send us your specifications and let us quote on costs.

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advise caution in precipitating a showdown unless the gains to be won by forcing abolition of the closed shop in any given case are worth the risk.

* * *

ANOTHER development of great significance in relation to the Taft-Hartley law is the at least partially successful drive of the United Automobile Workers of America (CIO) under the leadership of Walter Reuther to enlist members of other CIO unions which have not complied with terms of the law.

* * *

REUTHER'S organization claims that it has signed up more than 1,500 members of the Mine, Mill and Smelter Workers and the United Electrical, Radio and Machine Workers. Both of the latter are left wing affiliates of the Congress of Industrial Organizations.

* * *

OFFICERS of these latter two unions have refused to sign non-Communist affidavits. Failure to do so makes their unions ineligible to seek collective bargaining representation in any plant through elections conducted by the National Labor Relations Board.

* * *

IN several cases where trouble has arisen between locals of these unions and their employers the United Automobile Workers have stepped in and invited members to join up with them.

* * *

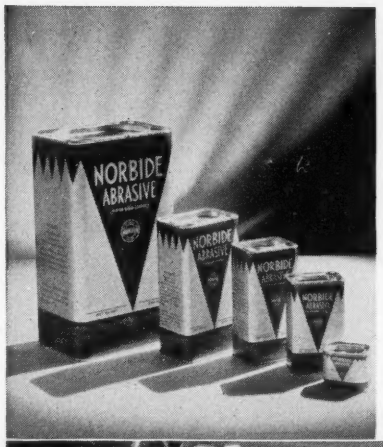
AFTER securing some members in this way the UAW can then petition for a representation election. It can appear on the ballots because its officers have signed the affidavits. The UE and MM&S unions, on the other hand, cannot appear on the ballots.

* * *

IF the workers in these plants wish to vote against the UAW they must vote for no union.

* * *

IT is probable that many employers in the wire and wire products manufacturing business could by allowing such developments in their plants, find themselves dealing with



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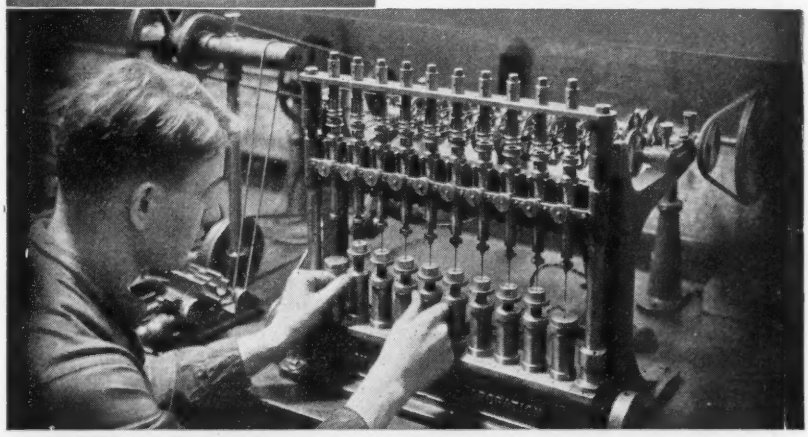

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another union in a matter of months.

* * *

HOWEVER, caution is in order here also. There are continuing troubles within the UAW itself, though Reuther made a clean sweep of the last elections. It is by no means certain that his leadership within the union is permanent. On the other hand it is almost inevitable that hot factional fights will continue.

* * *

IT is regarded by labor experts here, as highly probable that a switch from EU or MM&S to UAW might be jumping from the frying pan into the fire.

* * *

New Resistance Welding Alloy Catalog

WIDESPREAD development of resistance welding in the past several years calls for parallel development of alloys used in spot welder tips, electrodes, flash and projection welding dies and seam welder discs.

* * *

ACME Electric Welder Company's Alloy Catalog No. 502 depicts a complete new line made from Acmeloy, Superloy and Stainaloy. New items include a variety of special goose-neck tips, offset tip holders and seam welder discs, also a complete line of standard tips and holders. Price, specifications and complete stock list of all tips and alloys are included in the Catalog.

* * *

THIS Catalog may be obtained by writing to Acme Electric Welder Company, 2618 Fruitland Road, Los Angeles 11, Calif.

* * *

Emmert Replaces Callard at Westinghouse

L. R. Emmert has been appointed manager of rural electrification, Westinghouse Electric Corp., Pittsburgh. Mr. Emmert joined Westinghouse in 1936 and has been in the Philadelphia and Washington offices. He succeeds **N. H. Callard,** who has accepted a position with the Hilo Electric Light Co. of Hilo, Hawaii.

New Recorder Provides Continuous, Permanent Record of Speed or Production

A new speed and production recorder, model R-300-H, has just been announced by the **Electric Tachometer Corporation,** 22nd and Vine Sts., Philadelphia, Pa.

* * *

THE new rugged, gear-driven unit is electrically operated and produces a permanent record of speed and production when properly installed on any industrial machine. The recorder consists essentially of a synchronizing contactor which may be attached to and driven by the prime mover or industrial machine. A unique patented step-by-step motor in the recording instrument is electrically connected to the contactor and follows its motion. This motor, by means of gears and feed screw, drives a steel stylus across the wax-coated chart. At one-half minute intervals the master clock, an integral part of the system, makes contact to disengage the feed screw which is revolved backwards by a return spring restoring the pen arm to zero. The same contact feeds the chart downward at the rate of 2 inches per hour. This cycle of operations, when repeated, produces a series of parallel lines, the length of which is proportional to speed or production. The ends of the lines form a speed curve.

* * *

IN designing this instrument, the Electric Tachometer Corporation has incorporated all the features most sought by factory and management production executives. Increased labor costs accent the importance of having a permanent record of speed and production such as is provided by this recorder.

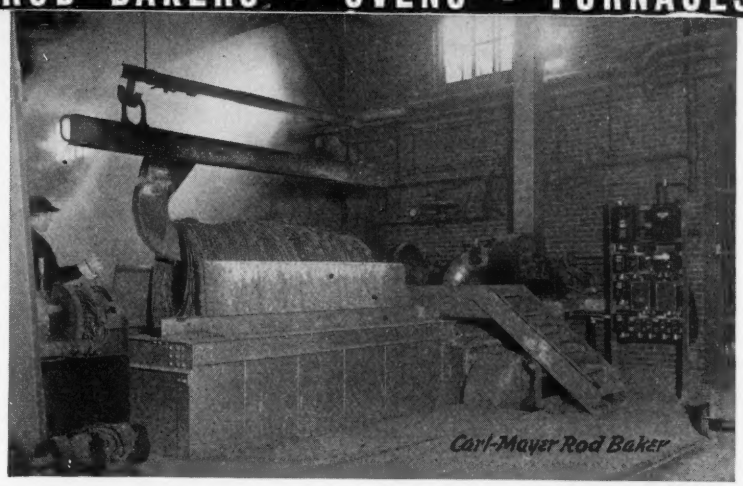
* * *

THIS instrument produces a continuous record of operating speed, showing the slightest irregularity in speed, as well as idle time. It provides a basis for comparing one run with another, for analyzing the cause of stoppages, for increasing production, and reducing costs.

* * *

THE instrument is guaranteed to have an accuracy of one-half of one per cent of full scale. This

MORE PRODUCTION with CARL-MAYER HI-SPEED ROD BAKERS - OVENS - FURNACES



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If it's twisted folded pressed crushed shaped braided woven **paper**

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fine, treated yarns wound 4 ends parallel for high-speed wrapping by new Abbo-sealed process will be available soon.

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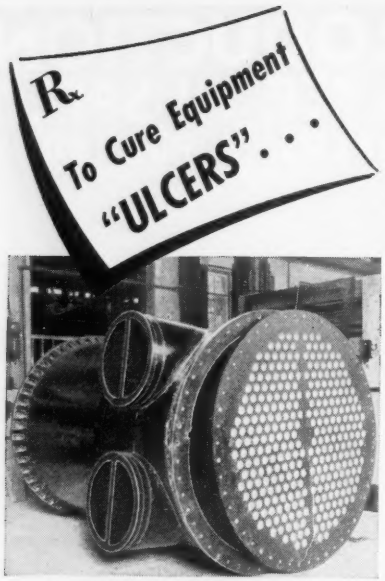

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accuracy is positively maintained as long as the instrument is operative. It is not affected by changes in voltage of the supply current, vibration of the machine, temperature, or wear of any parts. The torque at the pen arm is exactly the same for slow speeds as for high speeds. The accuracy, therefore, is the same at all parts of the chart. Since the Recorder is electrically driven, it may be installed at any remote position desired—the superintendent's office, near the foreman's desk, or in another building.

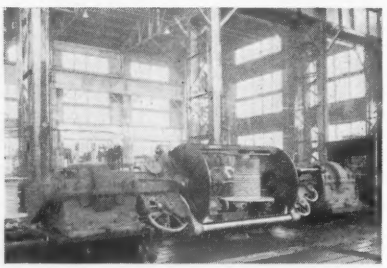
* * *

COMPLETE information may be secured from the manufacturer.

* * *

Special Stranders Built for Western Electric

FIVE cable stranders, specially designed by engineers of **Western Electric Company** to help meet unprecedented production demands for telephone cable, have been completed at the Eddystone plant of the Baldwin Locomotive Works. Two of the machines will be delivered to Western Electric's Kearny, N. J. Works, and the others to its Hawthorne Works, Chicago, Ill.



Cable Strander Built by Baldwin Locomotive Works for Western Electric Co. * *

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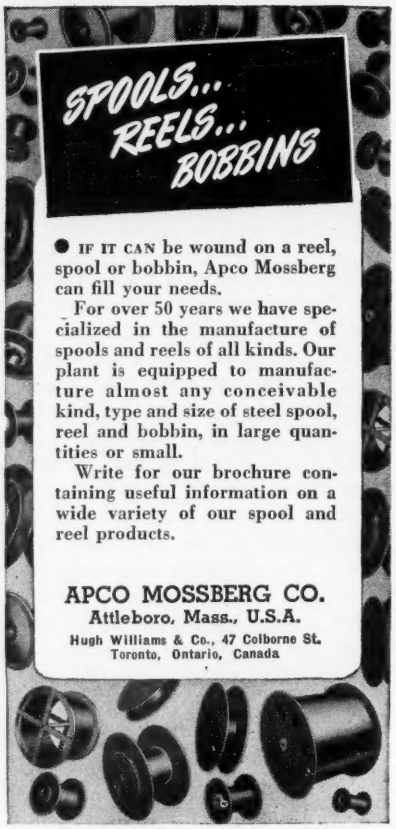
THESE machines rotate at 200 R.P.M., and will strand 26, 51 and 101 pairs of 19, 22, 24 or 26 gauge wire into cable at 600 linear feet per minute. Because of their great size and the close tolerances and balancing required, extraordinary care was required in the manuafcture of these stranders.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THE Crum calculator is designed especially for wire drawing jobs involving eight or fewer drafts. Problems involving a greater number of drafts can be solved, however, with extra manipulation. For instance, if it be desired to set up a multi-draft machine to draw .0095 inch diameter wire from .0625 inch stock in sixteen drafts, the intermediate die sizes can be determined by the calculator.

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Improved Polishing Lathes

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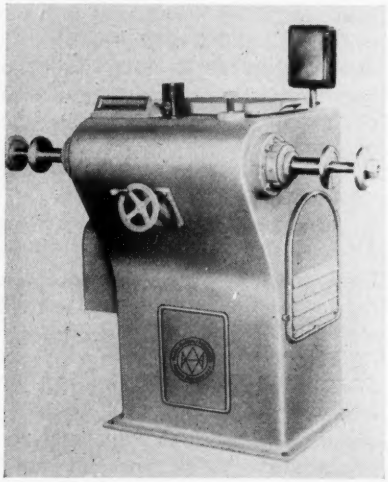

Hanson-Van Winkle-Munning Polishing Lathes

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THE lathe is ruggedly built into a strong, welded steel base. Spindles turn in pressure-lubricated, self-aligning ball bearings. The start-stop push button is within easy reach, while the magnetic starter is out of the way. Lubrication of the pulley is easy. Louvre doors afford easy access to the motor and provide adequate ventilation.

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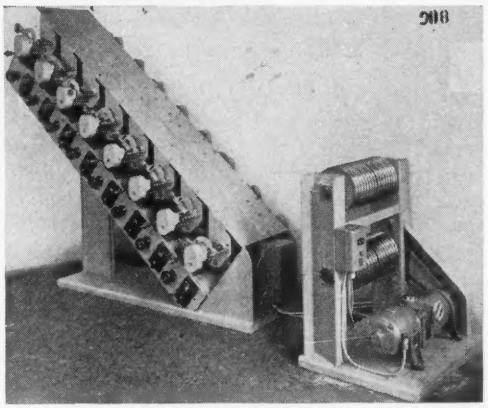

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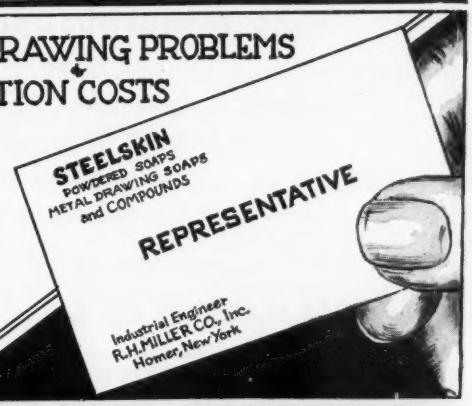

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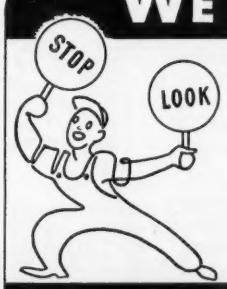

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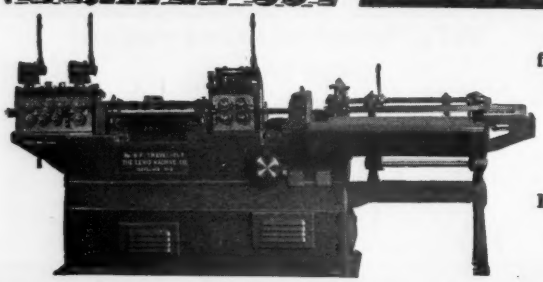

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Automatic
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New Model K Electronic Micrometer

TO fill the need for a lower-cost working standard measuring instrument, **Carson Micrometer Corp.** announces the new Model K Electronic Micrometer for measuring fine wire, paper thickness, rubber sheet, paint films and other thin materials — hard or soft, conducting or non-conducting. This new instrument measures materials as thin as .0001" with an accuracy of 20 millionths of an inch, under anvil pressures as light as ¼ oz. Operation of the instrument is independent of operator skill or sense of touch.

* * *

MEASURING range of the Model K is ⅛ in., but micrometer head may be raised to accommodate work up to ⅜ in. thick. Anvils are of hardened steel and may be of any diameter from 1/64 in. to 5/16 in., with flat or spherical surfaces. Anvil pressure may be any value from ¼ oz. to 1 lb. Standard combination is ⅛ in. flat anvils and 2 oz. anvil pressure, with anvils lapped flat and parallel to 10 millionths.

* * *

TO operate instrument, lower anvil is retracted by lever at side of instrument to insert work. When lower anvil is released, upper anvil is lifted by thickness of work between anvils. Distance upper anvil is lifted is measured by micrometer dial, with the exact setting indicated by light on panel of electronic unit.

* * *

MICROMETER dial is 3 in. in diameter with white graduations on a black background. Each revolution of dial is .025 in. as for a hand micrometer. Each .001 in. is numbered, and fine divisions on dial are .0001 in. Index is readily adjusted to exact zero position at all times without use of special tools.

* * *

INSTRUMENT responds to differences of less than 10 millionths; and repeats to 10 millionths. Accuracy is not influenced by anvil

A Coat of Many Values

MANY wire-mill superintendents have discovered the value of coating ferrous rods and wire by the Oakite CrysCoat Process. They have learned that this economical process offers 5 big advantages:

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The Oakite Technical Service Representative in your neighborhood will be glad to show you how easy it is to install the Oakite CrysCoat Process in your mill.

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* * *

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THE greatest single application of aluminum ever achieved in the building trades was unveiled recently in Davenport, Iowa, with the disclosure by **Thomas D. Jolly**, vice-president in charge of engineering and purchases, **Aluminum Company of America**, that the company is using more than six and a quarter million pounds of aluminum in the construction of its nearly completed Davenport sheet and plate rolling mill.

* * *

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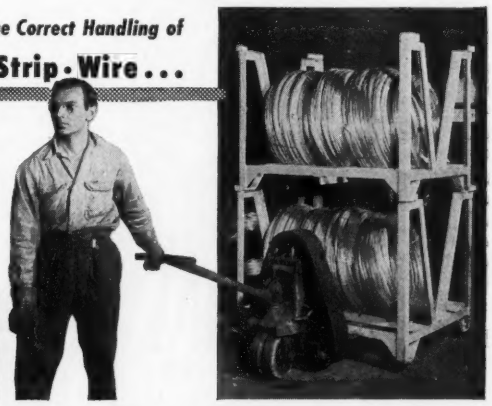

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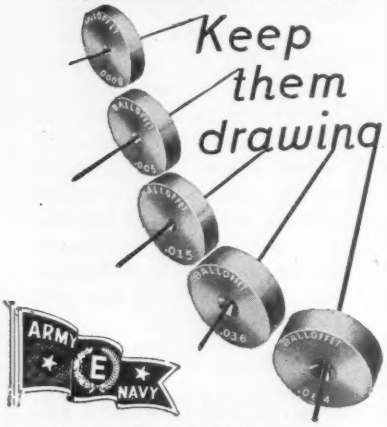

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* * *

MORE than three miles of aluminum insulated wall panels, weighing over a million pounds, compose the bulk of the exterior surface of the huge project. The remainder consists of nearly 500,000 square feet of aluminum window sash, and part of the plant's 400-odd aluminum doors. Covering the modern rolling mill, which has grown on what was a 400-acre farm site two years ago, is an aluminum roof which sprawls over 47 acres and contains nearly 3,000,000 pounds of the metal.

* * *

THE huge works is being equipped to turn out the widest aluminum sheet in the world. Dotting its roofs are 227 all-aluminum ventilators, ranging up to five feet in diameter. Surrounding the grounds and buildings is the longest aluminum chain-link fence ever constructed, eight feet high and four miles long, containing nearly two million feet of aluminum wire. Three strands of aluminum barbed wire top the fence.

* * *

THE spectacular display of the use of aluminum in the industrial construction field represents more than a desire to use the company's own product. Every application, he points out, has been given careful study by Alcoa's engineering department, as well as the engineering departments of the construction and sub-construction companies involved. Aluminum has been utilized only where it possesses definite advantages over other materials in weight, cost, physical properties, ease of erection, maintenance, or one of several other factors. As an example, a five-man crew can lay the prefabricated aluminum roof at a rate of 5,000 square feet per day, and eight men can erect a bay of aluminum exterior wall surface 20 feet long by 12 feet high in two hours.

* * *

NEARLY a million pounds of aluminum in its mill for office partiand conduit were used at the new works, resulting in considerable savings in cost. This included 1,340

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miles of insulated aluminum wire and cable for the plant's power and light requirements, and 98 miles of aluminum conduit ranging in size from one-half inch to five inches in diameter. In addition, there are 6,800 aluminum lighting fixtures, thousands of them with aluminum reflectors. Six high-voltage power line transmission towers on the grounds are built with aluminum alloy structural shapes, as is the electric switch tower, where power for the rolling mill enters the site.

* * *

ALCOA also has utilized aluminum in its mill for office partions, hardware, heating and ventilating ducts, roof drains, flashing and fire protection systems. Aluminum foil is being installed on the inside of the mill office building's concrete walls as a moisture-vapor barrier.

* * *

Wire Association Elects Officers for 1948

(*Continued from page* 406)

of their Individual Businesses." Mr. Stockdale emphasized the fact "the material cost of one producer becomes the labor cost of another", which means that raw material becomes the labor charge of another producer in the breakdown analysis. The address was interesting, inspiring and educational.

* * *

THE meeting closed with the showing of a sound, color motion picture film entitled, "Watts in Glass" which was presented through the courtesy of the Owens-Corning Fiberglas Corporation of Toledo, Ohio.

* * *

The Fume Problem

(*Continued from page* 405)

this method now requires the neutralization of the acid before it can be run into the city sewer system.

* * *

Summary

IT is now extremely important to summarize just what can be done to eliminate fumes, to reduce fumes,

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and to control fumes. These are the following —

1. **HAVE A VERY LARGE PICKLE CAPACITY — this is the most important engineering factor.**
2. **CORRECT FUME CONTROL IS ACCOMPLISHED BY ENCLOSED SYSTEMS. The fume producing operation must be enclosed in a tight system of fume removal.**
3. **THE LIQUID FLUX TECHNIQUE ACTUALLY ELIMINATES A LARGE PART OF THE FLUXING FUMES.**
4. **COMMERCIAL INHIBITORS AND FOAM BLANKETS SHOULD BE USED ON PICKLING TANKS, STRIPPING TANKS, AND ON ALL ACID TANKS USED ON PICKLING OPERATIONS.**
5. **BALL VENTILATORS, ROOF VENTILATORS, UMBRELLA VENTILATORS, ALL IN THE ROOF, SHOULD ONLY BE USED AS SECONDARY ATMOSPHERE CLEARING EQUIPMENT; HOODS AND DOWN-DRAFT SYSTEMS WITH THE PROPER SUCTION EQUIPMENT IN A CLOSED SYSTEM ARE THE PRIMARY FUME ELIMINATING EQUIPMENT.**
6. **EACH FUME MUST BE HANDLED AS A SEPARATE FUME PROBLEM, USING THE PROPER HOODS AND ENCLOSED SYSTEM OF FUME CONFINEMENT, ALONG WITH INHIBITORS, AND OTHER FUME REDUCING METHODS.**
7. **A CAREFUL STUDY OF MINIMUM FUME ATMOSPHERIC CONDITIONS SHOULD BE MADE, AND THESE CONDITIONS DUPLICATED BY AIR CONDITIONING, AND THE INTRODUCTION OF MODERN HOT AIR HEATING EQUIPMENT.**
8. **WHEN PRACTICAL, THE MORE EXPENSIVE AND MORE COMPLICATED RUBBER-LINED FUME WASHER, AND FUME SEWER AND WASTE LIQUOR HANDLING EQUIPMENT SHOULD BE INSTALLED, AND THE LIQUORS NEUTRALIZED SO THAT THEY WILL BE HARMLESS WHEN RUN INTO CITY SEWER LINES.**

* * *

IF ALL of the above fume control methods and equipment are intellingently employed, it is believed that both pickling and galvanizing fumes will be reduced to an absolute minimum.

* * *

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Wire Forms

(*Continued from page 398*)

ALTHOUGH foregoing rules doubtless have exceptions in certain specific cases, they can, if followed, result in many economies, hence designs of new wire forms may well be checked against the rules and appropriate changes made where economies are promised without sacrifice of necessary features of design.

* * *

STUDY of accompanying illustrations of wire forms and of explanatory captions (or of any group of wire forms available) may well suggest desirable features of design not mentioned in the text. Any such study will at least reveal some things that have been accomplished and may indicate where possible economies have been sacrificed. To the attentative designer, such observations are likely to suggest types of construction that he can apply to advantage in his own design work.

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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Directory, Index & Buyer's Guide.

ABRASIVES—
Norton Co., Worcester, Mass.

ACID INHIBITORS—
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

ACID-PROOF CONSTRUCTION
Haveg Corporation, Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

ANNEALING MACHINES—Open Flame
Syncro Machine Co., Perth Amboy, N. J.

ANNEALING POTS AND BOXES—
Laribee Machine Co., Inc., Camden, N. Y.
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Foundry & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc., Pawtucket, R. I.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Ross, J. O., Engr. Corp., New York, N. Y.

BAR STOCK—Stainless Steel
Armco Steel Corp., The, Middletown, Ohio.
American Steel & Wire Company, Cleveland, Chicago, New York.
Columbia Steel Co., San Francisco, Calif.
U. S. Steel Export Company, New York, N. Y.

BENDERS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

BORAX—Wire Drawing
Pacific Coast Borax Corp., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRAKES—Pneumatic
Entwistle, Jas. L. Co., Pawtucket, R. I.

BRAKES & SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

CABLE LACQUERING OVENS—
Industrial Ovens, Inc., Cleveland, O.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N.J.

CEMENTS—Acid Proof
Sauereisen Cements Co., Pittsburgh, Pa.

CEMENTS—Refractory
Norton Co., Worcester, Mass.
Sauereisen Cements Co., Pittsburgh, Pa.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila, Pa.
Magnus Chemical Co., Garwood, N. J.
Nopco Chemical Co., Harrison N. J.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIP.—
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corp., Newark, Del.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

CLOTH TESTERS—
Scott Testers, Inc., Providence, R. I.

CLOTH—WIRE, All Metals
Roebling's, John A. Sons, Co., Trenton, N. J.
Wickwire Spencer Steel Division, Colorado Fuel & Iron Corp., Buffalo, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COILERS—Sheet, Strip and Wire
Entwistle, Jas. L. Co., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
Laribee Machine Co., Inc., Camden, N. Y.
Ruesch, H. J. Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

COLD HEADERS—
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Diamond
Magnus Chemical Co., Garwood, N. J.
Union Wire Die Company, New York, N. Y.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Nopco Chemical Co., Harrison N. J.
Oakite Products, Inc., New York, N. Y.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison N. J.
Oakite Products, Inc., New York, N. Y.
Pacific Coast Borax Corp., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.
Swift & Company, Chicago, Ill.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Machinery Inc., Pawtucket, R.I.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, New York.
Vascoloy-Ramet Corp., North Chicago, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K., Inc., Everett, Mass.

DIAMONDS—Industrial
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Champion Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Champion Diamond Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND TOOLS—
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Cochaud Wire Die Corp., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Union Wire Die Corp., New York, N. Y.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., Croton-on-the-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.

DIES—Lead Extrusion
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth Sterling Steel & Carbide Co., McKeesport, Pa.
Metal Carbides Corporation, Youngstown, Ohio.
Robertson, John, Co., Brooklyn, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies Inc., Fort Wayne, Ind.
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Eastern Tungsten Carbide Co., Newark, N. J.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Sintered Carbide
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Special Shapes, Etc.
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp., Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.

DIES—Tubing
Hoosier Carbide Die Co., Ft. Wayne, Ind.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N.J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Hoosier Carbide Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, Ohio.
Rusch Wire Die Corp. Croton-on-the-Hudson, N.Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Wks., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Flange Steel
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., The, Paterson, N. J.

DRYING EQUIPMENT—
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

WHERE TO BUY, Continued

ENGINEERS—Consulting Wire Mill
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Elec. Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros., & Co., The, Waterbury, Conn.

FLUXES—Soldering
American Chemical Paint Co., Ambler, Pa.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin, Wm. M. Co., Pittsburgh, Pa.

FRICTION PAY-OFF STANDS—
Industrial Ovens, Inc., Cleveland, Ohio.

FURNACES—Annealing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Cook Engineering Co., Paterson, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Hayes C. I., Providence, R. I.
Morrison Engineering Corporation, Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, Ohio.
Furnace Engineers Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Electric
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Hayes, C. I., Providence, R. I.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

FURNACES—Hard'ing & Temp'ing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engr. Co., The, Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Pot (Oil, Gas, Electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Healing, Strand
Cook Engineering Co., Paterson, N. J.
Morrison Engineering Corporation, Cleveland, O.
Trauwood Engineering Co., Cleveland, Ohio

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Eisler Engineering Co., Newark, N. J.
Electric Furnace Co., Salem, Ohio.
Furnace Engineers, Inc., Pittsburgh, Pa.
Surface Combustion Corporation, Toledo, O.
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio.

GALVANIZING ENGINEER—Consulting
Spowers, W. H., Jr., New York, N. Y.

GALVANIZING EQUIPMENT—
Hanson-Van Winkle-Munning Co., Matawan, N.J.
Steel Equipment Co., Cleveland, Ohio.
Wean Equipment Corp., Cleveland, Ohio.

GAVANIZING FLUXES—
Hanson-Van Winkle-Munning Co., Matawan, N.J.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GRINDERS—Roll
Norton Co., The, Worcester, Mass.

HOISTS—Electric Travelling
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M. Co., Pittsburgh, Pa.

INSULATING LACQUERING SYSTEMS—Continuous
American Insulating Machine Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

INSULATING MATERIALS—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Martin, Glenn L. Company, Baltimore, Md.
Owens Corning Fiberglas Corp., Toledo, O.
Standard Varnish Wks., Staten Island, N. Y.
Twitchell, E. W., Philadelphia, Pa.
Warren Thread Works, Inc., W., New York, N.Y.

LATHES—Die Reaming
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Morgan Construction Co., Worcester, Mass.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

LIME—
Warner Co., Philadelphia and Bellefonte, Pa.

LININGS—Acid and Alkali Proof
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

LUBRICANTS—For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.
Swift & Company, Chicago, Ill.

MACHINERY—Armoring (Cable, Wire Hose)
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Brazing
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Bunching
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H. Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Rope Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Entwistle, Jas. L. Co., Pawtucket, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Coilers
Eisler Engineering Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc,. Camden, N. Y.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (used), New York, N. Y.
New England Butt Co., Providence, R. I.
Ruesch, H. J. Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Machinery Inc., Pawtucket, R. I.

MACHINERY—Copper Wire Drawing and Rolling
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc,. Camden, N. Y.
National Machinery Exchange (used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire
American Insulating Mach'y Co., Phila., Pa.
National Rubber Machinery Co., Akron, Ohio
National Erie Corp., Erie, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Porter, H. K. Inc., Everett, Mass.
Shuster, F. B. Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Die Making
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Roos, H. & G., Tool & Mfg. Co., Montclair, N.J.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Edging
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.
Laribee Machine Co., Inc., Camden, N. Y.
Syncro Machine Co., Perth Amboy, N. J.

WHERE TO BUY, Continued

MACHINERY—Extruding
National Erie Corp., Erie, Pa.
National Rubber Machinery Co., Akron, Ohio.
Robertson John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Forming
Eisler Engineering Co., Newark, N. J.
National Mach'y Exch. (Used), New York, N.Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.
Reed & Richards, Transatlantic, Inc., New York,
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Galvanizing
(See Galvanizing Equipment)

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio.
Wilson, Lee, Engr. Co., Cleveland, Ohio.

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Pawtucket, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y Co., Phila., Pa.
National Erie Corp., Erie, Pa.
National Rubber Machinery Co., Akron, Ohio.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lead Encasing Presses, etc.
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John Co., Brooklyn, N. Y.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Material Handling
Cleveland Tramrail, Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Fab-Weld Corporation, Philadelphia, Pa.

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
Entwistle, Jas. L. Co., Pawtucket, R. I.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Panning
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Perth Amboy, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Plating Electrolytic
Hanson-Van Winkle-Munning Co., Matawan, N.J.

MACHINERY—Pointing
Aetna Standard Eng'g Co., The, Youngstown, O.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Rubber Insulating
National Rubber Machinery Co., Akron, O.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R. I.

MACHINERY—Rubber Tubing and Straining
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Screw Wire
National Mach'y Exch. (Used), New York, N.Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y Co., Phila., Pa.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
National Erie Corporation, Erie, Pa.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Spooling
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Entwistle, Jas. L. Co., Pawtucket, R. I.
Laribee Machine Co., Inc., Camden, N. Y.
National Mach'y Exch. (Used), New York, N.Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury, Conn.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio.
Wire & Textile Mach'y, Inc., Pawtucket, R. I.

MACHINERY—Spring Making
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Lewis Machine Co., The, Cleveland, Ohio.
National Mach'y Exch. (Used), New York, N.Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Stranding
Hughesville Machine & Tool Co., Hughesville, Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Ruesch, H. J., Machine Co., Newark, N. J.
Steel Equipment Co., Cleveland, Ohio
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Swaging
National Erie Corp., Erie, Pa.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Testing Physical
American Optical Co., Buffalo, N. Y.

MACHINERY—Testing Equipment—Sparkers
Davis, R. L. Elec. Co., Wallingford, Conn.
Entwistle, Jas. L., Pawtucket, R. I.
Scott Testers, Inc., Providence, R. I.
Wire & Textile Machinery, Inc., Pawtucket, R.I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Steel Equipment Co., Cleveland, Ohio.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila, Pa.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
National Erie Corp., Erie, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Winding
American Insulating Mach'y Co., Phila, Pa.
Eisler Engineering Co., Newark, N. J.
Laribee Machine Co., Inc., Camden, N. Y.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wind-up (Constant Tension, Variable Speed)
Aetna Standard Eng'g Co., The, Youngstown, O.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

MACHINERY—Wire Drawing
Aetna Standard Eng'g Co., The, Youngstown, O.
American Insulating Mach'y Co., Phila., Pa.
Eisler Engineering Co., Newark, N. J.
Laribee Machine Co., Inc., Camden, N. Y.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N.Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wood Screw
National Mach'y Exch. (Used), New York, N.Y.

MATERIAL HANDLING EQUIPMENT
Cleveland Tramrail, Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.
Fab-Weld Corporation, Philadelphia, Pa.

NAILS—Wire
American Steel & Wire Co., Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill
Roebling, John A. Sons Co., Trenton, N. J.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
U. S. Steel Export Co., New York, N. Y.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Chase Brass & Copper Co., Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.

WHERE TO BUY, Continued

OPTICAL EQUIPMENT—Metallurgical
American Optical Co., Buffalo, N. Y.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila., Pa.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Dehydrogenizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.

OVENS—Industrial
Carl-Mayer Corp., The, Cleveland, Ohio.
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Ross, J. O., Engr. Corp., New York, N. Y.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER—Creped Wrapping
Crepe-Kraft Co., Newark, N. J.

PAPER—For Coil Wrapping and Corrosion Prevention
Crepe-Kraft Co., Newark, N. J.

PAPER TESTERS—
Scott Testers, Inc., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D.C.

PICKLING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Parkin, Wm. M., Co., Pittsburgh, Pa.

PICKLING—Hooks, etc. Acid Resisting
Gordon, Clark E., Detroit, Mich.

PICKLING TANK LININGS—
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTIC TESTERS—
Scott Testers, Inc., Providence, R. I

PLATING PROCESS—Electrolytic
Hanson-Van Winkle-Munning Co., Matawan, N.J.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

POTS—Lead Melting
National Annealing Box Co., Washington, Pa.
Robertson, John, Co., Brooklyn, N. Y.

POWDER—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H., Co., Inc., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Potter, Neil C., Newark, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Mach. Co., Trenton, N.J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REEL AND TENSION STANDS—
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Collapsible
Entwistle, Jas. L. Co., Pawtucket, R. I.

SPOOLS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS AND SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg., Co., The, Hazardville, Conn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Takeoff
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Hazardville, Conn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Vulcanizing & Impregnating
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Mfg. Co., New Haven, Conn.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Wooden
Acrometal Products, Inc., Minneapolis, Minn.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

RESISTANCE HEATING—Annealing, Patenting, Etc.
Trauwood Engr. Co., Cleveland, Ohio.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N.Y.

RODS—Nickel Alloy
Eastwood Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

RODS—Stainless Steel
Armco Steel Corp., The Middletown, Ohio

RODS—Wire—Non-Ferrous
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Wire
American Steel & Wire Company, Cleveland, Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Roebling's, John A., Sons Co., Trenton, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel, Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott Testers, Inc., Providence, R. I.

RUST PROOF COMPOUNDS—
(See Compounds—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See Compounds—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

SHEARS—
O'Neil-Irwin Mfg. Co., Minneapolis, Minn.

SHEET—Steel
Armco Steel Corp., The Middletown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

SOAPS—Industrial and Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Magnus Chemical Co., Garwood, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison N. J.
Potter, Neil C., Newark, N. J.
Procter & Gamble, Cincinnati, Ohio.
Swift & Company, Chicago, Ill.

SOLVENT RESIN SYSTEMS—Experimental
Industrial Ovens, Inc., Cleveland, Ohio.

SPOOLS—Annealing and Wire Drawing
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

REELS—Drawn Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.

SPOOLS—Shipping and Shop
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp.,

SPOOLS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Howsam Spool Company, Aurora, Ill.
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

STAMPINGS—Steel
Hubbard Spool Company, Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non-Ferrous
Chase Brass & Copper, The Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Armco Steel Corp., The Middletown, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Roebling's, John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

TANK—Compound
Haveg Corp., Newark, Del.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling
Haveg Corp., Newark, Del.
Sauereisen Cements Co., Pittsburgh, Pa.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.
National Annealing Box Co., Washington, Penna.

TINSEL—Cords, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Electric Conductor
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Electric Resistance
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Lame, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Thread, Silver and False Gold
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TINSEL—Thread, Decorative
Hudson Wire Co., Ossining, N. Y.
Montgomery Co., The, Windsor Locks, Conn.
North American Philips Co., Inc., New York, N.Y.

TOOLS—Wire Cutting
Porter, H. K., Inc., Everett, Mass.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRAVERSES—For Reels
Entwistle, James L. Co., Pawtucket, R. I.
Hubbard Spool Company, Chicago, Ill.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
Laribee Machine Co., Inc., Camden, N. Y.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Niles Steel Products Div., Republic Steel Corp., Niles, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

TUBE BENDERS AND FORMERS—
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ruesch, H. J. Machine Co., Newark, N. J.

VALVES AND FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—For Insulation
General Electric Co., Schenectady, N. Y.
Standard Varnish Wks., Staten Island, N. Y.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Sciaky Bros., Inc., Chicago, Ill.

WIND-UP AND UNWIND SYSTEMS—Continuous
American Insulating Mach'y. Co., Phila., Pa
Davis, R. L. Electric Co., Wallingford, Conn.
Entwistle, James L., Co., Pawtucket, R. I.
Industrial Ovens, Inc., Cleveland, Ohio.
Watson Machine Co., Paterson, N. J.
Wire & Textile Machy, Inc. Pawtucket, R. I.

WIRE—Aluminum
Aluminum Co. of America, Pittsburgh, Pa.
Malin & Co., Cleveland, Ohio.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland-Chicago, New York.
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's John A., Sons Co., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Electric
Chase Brass & Copper, The, Waterbury, Conn.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Enameled for Coils
North American Philips Co., Inc., New York, N.Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland-Chicago & New York.
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper, The, Waterbury, Conn.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Roebling's, John A., Sons Co., Trenton, N. J.
Tennessee Coal, Iron & R. R. Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Spencer Steel Div., of Colorado Fuel & Iron Corp., Buffalo, N.Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Nickel & Nickel Alloy
Eastwood-Nealley Corp., Belleville, N. J.
International Nickel Co., Inc., New York, N.Y.

WIRE—Music
American Steel & Wire Co., Cleveland,Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Ecca Machine Corp., New York, N. Y.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., Cleveland, Ohio.
Paramount Wire Co., 100 Bleecker St., New York, N. Y.
U. S. Steel Export Co., New York, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper, The, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
Malin & Co., Cleveland, Ohio.

WIRE—Non-Ferrous to Specification for Special Purposes
Chase Brass & Copper, The, Waterbury, Conn.
Eastwood-Nealley Corp., Belleville, N. J.
Hudson Wire Co., Ossining, N. Y.
North American Philips Co., Inc., New York, N.Y.
Paramount Wire Co., 100 Bleecker St., New York, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRESERVING—Paper and Cotton
Paramount Wire Co., 100 Bleecker St., New York, N. Y.

WIRE—Spring
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland - Chicago - New York
Bethlehem Steel Co., Bethlehem, Pa.
Columbia Steel Co., San Francisco, Calif.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
U. S. Steel Export Co., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
Armco Steel Corp., The Middletown, Ohio
American Steel & Wire Co., Cleveland-Chicago-New York.
Columbia Steel Co., San Francisco, Calif.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.
U. S. Steel Export Co., New York, N. Y.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Firth-Sterling Steel & Carbide Co., McKeesport, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Paramount Wire Co., 100 Bleecker St., New York, N. Y.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Straightening and Cutting—
Pittsburgh Cut Wire Co., Pittsburgh, Pa.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE CLOTH—Industrial
Roebling's John A., Sons Co., Trenton, N. J.
Wickwire Brothers, Cortland, N. Y.
Wickwire-Spencer Steel Division of Colorado Fuel & Iron Corp., Buffalo, N. Y.

WIRE TESTERS—
Scott Testers, Inc., Providence, R. I.

WIRE, WEAVING—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.

WRAPPING PAPER—Creped
Crepe-Kraft Co., Newark, N. J.

YARNS & TAPES—
Du Pont de Nemours, E. I., Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Owens Corning Fiberglas Corp., Toledo, Ohio.
Twitchell, E. W., Philadelphia, Pa.
Warren Thread Works, Inc., W., New York, N.Y.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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May, 1948

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GANG SPOOLERS—All Types and Sizes

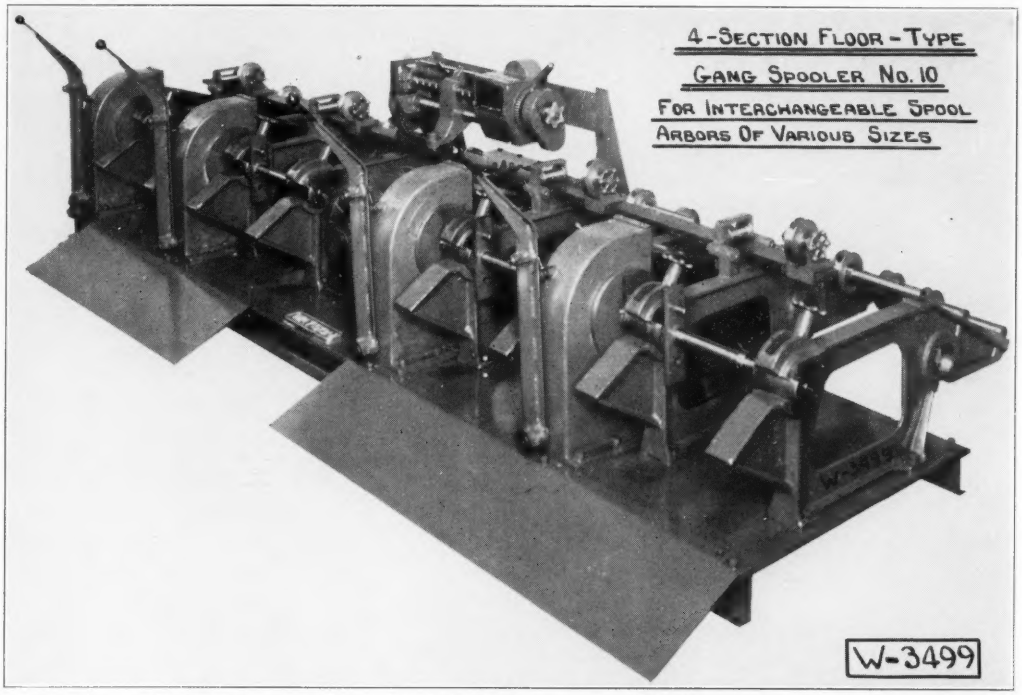
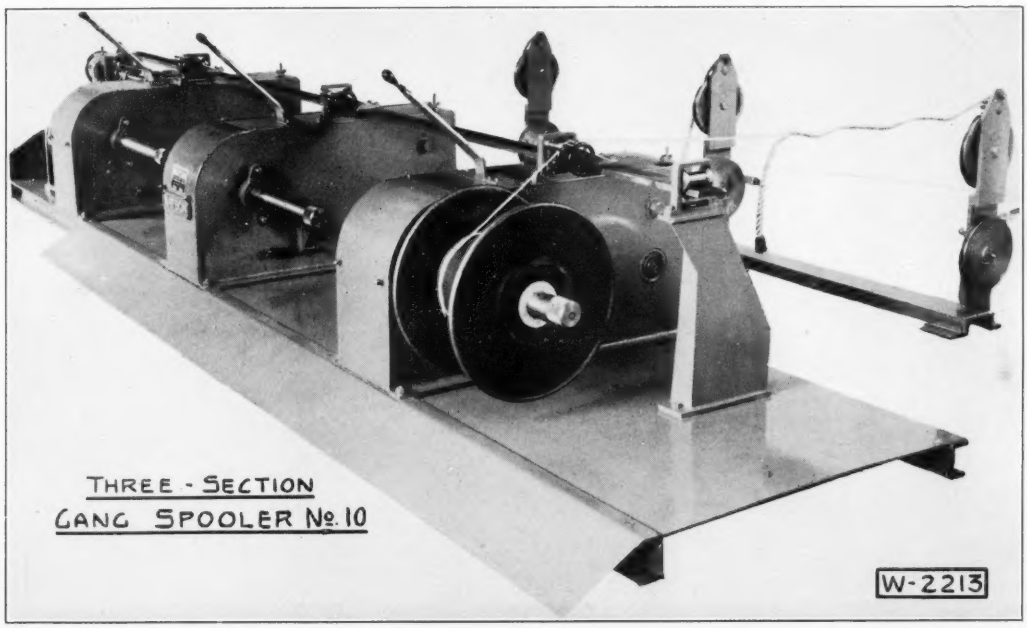


Table Types for small, Floor Types (shown here) for larger spools. Unit Shown Above is for large spools of small center bore, also for spools of varying dimensions. Unit Shown Below is for spools of sufficiently large bore to permit overhung mount and offers greatest case and rapidity of spool handling. All Units have "brake-drive" handles. Fully adjustable Automatic Gang Traverses with Centering Guide Adjustment at each spool.



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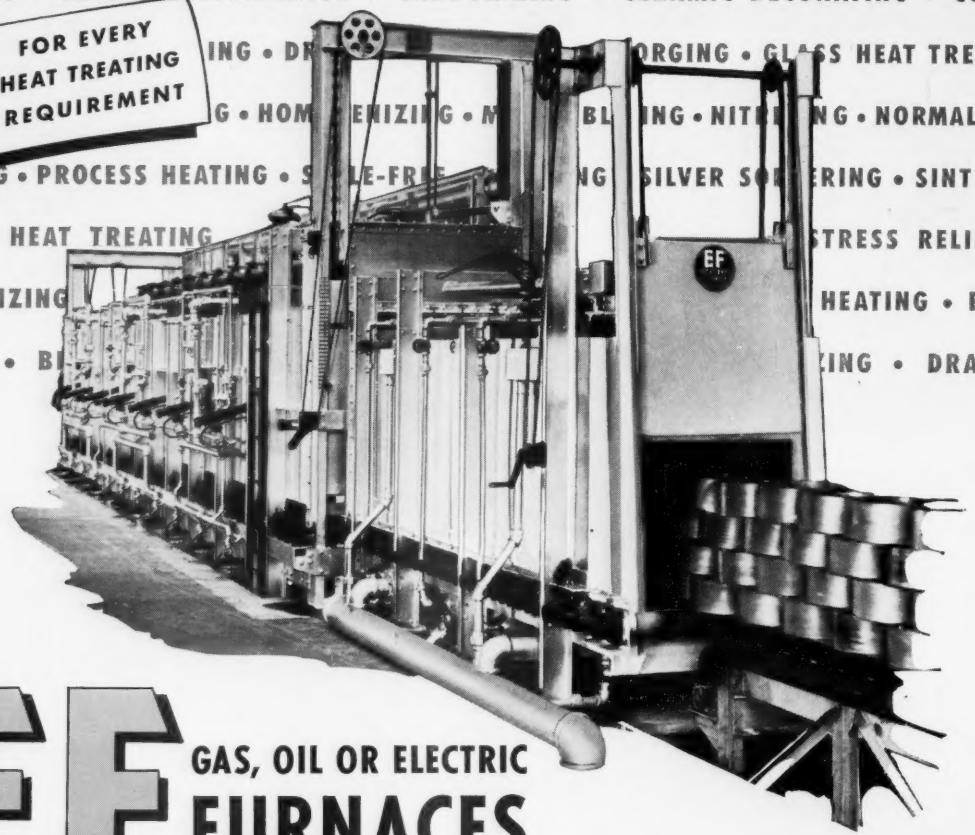
FOR EVERY HEAT TREATING REQUIREMENT



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